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THE
ANATOMY
OF THE
Humane Body.

With XXXI Copper-Plates.

By *W. CHESELDEN*,
Surgeon to St. *Thomas's*-
Hoſpital, and F. R. S.

Of all GOD's Works that do this World adorn,
There is not one more Fair and Excellent,
Than is Man's Body both for Power and Form.
Spenser.

The Second Edition.

LONDON:
Printed by S. Collins, and Sold by James
Knapton, John Sprint, William
Taylor, John Senex, William *and*
John Innys, John Osborn, *and* John
Noon. MDCCXXII.

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TO

Dr. *Richard Mead*,

FELLOW of the College of
Physicians in *LONDON*,
And FELLOW of the

ROYAL SOCIETY.

SIR,

EVERY part of PHYSICK may juſtly preſume on your Protection, to whom it owes ſo much Improvement. ANATOMY in particular has received ſuch Advantage from your LECTURES, that it were a kind of In-

Injuſtice, not to Dedicate all Endeavours in that way to you; in me indeed it would be unpardonable not to offer the Fruits of thoſe Studies, which at firſt began, and have ſtill been carried on with your Encouragement. The kind Reception my Induſtry has met with, is owing to you, the Authority of whoſe Opinion has in every Place ſecur'd me ſo much Favour; eſpecially in that Seat of Learning, that with diſtinguiſh'd Honours rewarded your Merit.

I am,

SIR,

Your moſt Oblig'd and

Obedient humble Servant,

W. CHESELDEN.

THE PREFACE.

T*HIS Treatiſe being deſigned for the Uſe of thoſe who ſtudy* ANATOMY, *I have diſpos'd it in the ſame Order in which it is uſually Taught. The* Bones *firſt, and then the* Muſcles, *becauſe the Knowledge of the* Bones *is neceſſary to the Knowledge of the* Muſcles, *and afterwards the* Veſſels, *becauſe their Situations are chiefly deſcribed by the* Bones *and the* Muſcles *near which they are ſituated. But before we ſhew* *the* Veſſels *in the Limbs, we find it neceſſary to ſhew the Parts in the three Cavities, and that in the Order of the Animal OEconomy; but the Parts of Generation, and the Five Sences, being fit to be conſidered ſeperately, they are all done in a diſtinct Book.*

IN deſcribing of the Parts, I have pretty much neglected the Minutiæ *in* ANATOMY: *Nor have I been very particular about thoſe Things which cannot be underſtood without being ſeen, and being ſeen need little deſcription; but have endeavoured to be more explicit about thoſe Things which are of greateſt Uſe in* PHILOSOPHY, PHYSIC, *and* SURGERY: *And I could wiſh the Dividing and Diſtinguiſhing of Parts was uſually carried no farther than is neceſſary to anſwer theſe valuable Ends.*

THIS Impreſſion has been Four Years in the Preſs, which gave me frequent Opportunities *to correct, add, and alter the Sheets, which in ſome Places has made the Lines and Pages crouded, and in other Places looſe; and has too often interrupted the Connection of the Sentences, without leaving me room enough to add all that I was inclin'd to. And thoſe Sheets in particular which were firſt Printed off, are without many Things which I cou'd now add.*

I muſt here acknowledge my Obligations to my Learned Friends MARTIN FOLKES, *Eſq; Dr.* JURYN, *and Dr.* OLDFIELD, *for aſſiſting me in Reviſing theſe Sheets, and particularly Dr.* OLDFIELD, *who undertook the greateſt Part of them: To whom I am* *alſo oblig'd for the Diſcovery of the Miſtake in Dr.* KEIL'*s Hypotheſis about the Advantage of ſmall Bladders compoſing a* Muſcle. *See Introduction to the* Muſcles, *and* Tab. VIII.

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INTRO-

INTRODUCTION.

THE receiv'd Opinion of the Texture of the Animal Body, is, That it is a Compages of Veſſels, variouſly diſpos'd, to form Parts of different Figures, for different Uſes.

THE Ancients ſuppos'd, That the HEART and BRAIN were firſt form'd, and that all the other Parts proceeded from them. They diſtinguiſh'd them into *Spermatic* and *Sanguineous*; and thought, becauſe the BRAIN was cover'd with Two Membranes, that all the other Parts muſt be ſo too; and frequently ingaged themſelves in Diſputes about the Derivation of Parts; with many other Things of the like Nature, Conſequences of their *Hypotheſis*. But the Moderns, aſſiſted with Glaſſes, have diſcover'd, That all the Parts exiſt in Miniature, from the firſt Formation of the *Fœtus*, and that their increaſe, is only the Extenſion and thickning of their Veſſels, and that no Part can owe its Exiſtence to another.

THUS much I thought neceſſary to Premiſe, that the Reader might have a general Idea of the Body, and that he may ſee for what Reaſon no notice is taken in this Treatiſe of the Diſtinctions and Diviſions of Parts, made by ancient ANATOMISTS, and thoſe who have Copy'd after them.

THE Conſtituent Parts of the Animal Body, are, *Nerves*, *Arteries*, *Veins*, *Lymphæducts*, *Excretory Veſſels*, *Fibres*, *Membranes*, *Glands*, *Muſcles*, *Tendons*, *Ligaments*, *Bones* and *Cartilages*; to theſe may be added the *Hair* and *Nails*, tho' they have only a Vegitative Kind of Life.

NERVES are Cylindrical Bodies, of ſtreight Fibres, which ariſe from the *Medulla Oblongata* of the Brain, and the *Medulla Spinalis*, and terminate in all the Senſitive Parts. They are the immediate Organs of Senſation.

THE ARTERIES, are Tubes that ariſe in Two Trunks from the Two Ventricles of the Heart, and thence dividing into Branches, diſtribute the Blood to every Part of the Body.

VEINS, are Tubes to return the Blood from the Extremeties of the Arteries to the Heart.

LYMPHÆ DUCTS, are pellucid Tubes to carry Lymph from all Parts, eſpecially the Glands, to the *Vaſa Lactea.*

EXCRETORY-VESSELS, are either Tubes from Glands to convey the ſecreted Fluids to their reſpective Places, or Veſſels from the ſmall Guts, to carry the Chyle to the Blood-Veſſels; theſe laſt, are call'd *Vaſa Lactea.*

FIBRES, as they appear to the naked Eye, are ſimple Threads of the minuteſt Blood-Veſſels or Nerves, or both, which enter into the Compoſition of every Part.

MEMBRANES, are Compages of Fibres, expanded, to cover, or line any other Part.

A GLAND ſecretory, is compos'd of an Artery, Vein, Lymphatic, Excretory-duct, and Nerve. The Uſe of Glands is to ſecrete Fluids from the Blood for ſeveral Uſes. The Artery is longeſt and makes the greateſt part of a Gland, it is convolv'd like the ſmall Guts, the Vein and Lymphatic only return the Blood, the Excretory Duct (which ariſes in a great many Branches from the ſides of the Arteries, as the Lacteal Veſſels do from the Guts) conveighs the Matter ſecreted to the Place it is deſign'd for; nevertheleſs Secretions may be made from the ſides of Veſſels in Membranes, without ſuch Excretory Ducts or Arteries thus Convolv'd, and in this manner I ſuppoſe all the leſſer ſecretions are made.

MUSCLES, are diſtinct portions of Fleſh, which, by contracting, perform the Motions of the Body.

TENDONS, are the ſame Fibres of which the Muſcles are compos'd, but more cloſely connected, that they may poſſeſs leſs ſpace in a Limb, and be inſerted in leſs room into a Bone.

LIGAMENTS, are ſtrong Membranes, or Bodies of Fibres cloſely united, either to bind down the Tendons, or give Origin to the Muſcles, or tie together ſuch Bones as have Motion.

BONES, are firm Parts to ſuſtain, and give ſhape to the Body.

CARTILAGES, or Griſtles, are hard, elaſtick, ſmooth and inſenſible: Their Uſe is to cover the Ends of the Bones that have Motion, to prevent their Attrition, *&c.*

What is call'd HAIR and NAILS, is ſufficiently known; the former ſeems to be nouriſh'd from the *Materia Perſpirabilis*, and the latter from the *Reticulum Mucoſum*, betwixt the *Cutis* and *Cuticula*.

⁂

BOOK I.

CHAP. I.

Of the Bones *in General.*

THE uſe of the Bones is to give ſhape and firmneſs to the Body, to be Levers for the Muſcles to act upon, and to defend thoſe Parts from external Injuries that are of greateſt Conſequence to be preſerv'd, as the Brain, Heart, &c.

They are in their firſt State very ſoft Fibres, till by the addition of a Matter, which is ſeparated from the Blood into them, they grow by degrees to the hardneſs of a Cartilage, and then perfect Bone: But this great change is neither effected in a very ſhort time, nor begun in all the parts of the ſame Bone at once. Flat Bones, ſuch as have their Fibres directed to all ſides, begin to oſſifie in a middle point; but Tab. v. C. thoſe flat Bones that have their Fibres nearly parallel, begin in a tranſverſe middle line, that is in the middle of each Fibre; and ſo the Cylindrical Bones in a middle ring, from which they ſhoot forth to their extremities; and by the continual addition of this oſſifying matter, the Bones encreaſe, till their hardneſs reſiſts a farther extenſion; and becauſe their hardneſs is always encreaſing while they are growing, the encreaſe of their growth becomes ſlower and ſlower, till they ceaſe to grow at all; and at length in old or weak Perſons, if I am not miſtaken in my Obſervations, they decreaſe as well as the fleſhy parts, but not ſo faſt, by reaſon of their hardneſs. In a Soldier that by a Shot in the left Groin had that Leg extreamly waſted, within a Year after the receiving of the Wound, being dead, the Bones of that Limb, as near as I can remember, were two fifths leſs then thoſe of the other: Now this Man muſt either have been taken lame into the Service, which cannot be ſuppoſed, or theſe Bones muſt have waſted nearly thus much for want of due Nouriſhment; for the Bones of the other Limb can't be thought to have grown much in that time. And this oſſifying matter of the Bones is ſo well directed to them by ſome wiſe Law, that I have never ſeen but one inſtance of a Bone in an adult Body unoſſified, which was ſo much of one ſide of the lower Jaw as is beyond the Teeth; but bony excreſſences upon the Bones are frequent, and even the fleſhy parts, eſpecially in old Perſons, are ſometimes oſſified: Tab. vi. F. 1. The moſt conſiderable inſtance of this kind that I have ever found, is of part of the Muſcular

Fibres of the Heart of a Man, nearer its Vertex then the Baſe, as large as a Sixpence, perfectly oſſified. And tho' it might ſeem that the Bones while they appear Cartilaginous differ from perfect Bones only in hardneſs, yet in a Child of two Years old that I kept in Vinegar, all the Bones grew near as ſoft and pliable as the fleſhy parts, tho' the Skin in ſeveral places was not taken off, yet the Cartilages and Cartilaginous *Epiphyſes* of the Bones were but little alter'd.

Bones that are without motion, as thoſe of
the Scull, the *Oſſa innominata*, &c. and alſo
Bones with their *Epiphyſes* when they meet
preſs into each other, and form Sutures, which
ſoon diſappear in thoſe that meet, while their
oſſific matter is ſoft; but thoſe that gain a
greater degree of hardneſs before they meet,
preſs more rudely into each other, and make
more uneven Sutures, ſome of which in the
Scull endure to the greateſt Age, and very Tab. iii.
often the oſſific matter not flowing far enough 1, 2.
to complete a Bone, the part uncompleted has
an oſſification begun in its Center, and is form'd
into a diſtinct Bone, which may happen to be
of any Figure; theſe Bones are ofteneſt found
in the Lambdoidal Suture, and are call'd *Oſſa* Tab. iii.
Triquetra. But the ends of thoſe Bones that 29.
are intended for motion, are hinder'd joyning
in either of theſe manners by the Cartilages
which cover them; for when theſe Cartilages

Tab. vi. E. are deſtroy'd they will joyn very readily; of which I have known a great many Inſtances.

The ends of all the Bones that are articulated for very manifeſt Motions, or that are not plac'd againſt other Bones, are tip'd with *Epiphyſes*, or additional Bones, which in ſome meaſure determine their Growth and Figure; for if they had nothing to give Bounds to them, they wou'd ſhoot out like the Callous from the broken ends of a Bone that is not ſet, and grow more ragged then the edges of Bones which are joyn'd by Sutures; and ſometimes *Epiphyſes* are made uſe of to raiſe Proceſſes upon Bones for the inſertions of Muſcles, as the Trochanters of the Thigh-bones, where it wou'd weaken the Bones too much to have ſuch Proceſſes rais'd out of their Subſtance.

Tab. v. 1, 2, 3.

Tab. ii. 16, 17.

The Fibres of Bones I have found by careful Experiments and Microſcopical Obſervations, to be connected to each other by the ſame means that the ſeveral parts of a Fibre are connected, that is, by that ſtrong attraction which belongs to Particles of matter in contact; but this coheſion of Fibre to Fibre is not equal to that in the parts of a Fibre, tho' very nearly; indeed, if it was, a Bone wou'd not be a ſtructure of Fibres but one uniform maſs like that of pure mettle, the coheſion of the parts of which are every way alike: Nor are the parts of the Bones diſpos'd into *Lamellæ*, *ſtratum ſuper ſtratum*, as *G------di*, and others, have painted; for, (not to mention the great diſadvantages of ſuch a ſtructure) they not only appear one ſolid uniform maſs to the naked Eye, but even with a Microſcope, till we come to their inner ſpongy texture, which alſo appears uniform, and if we examine an exfoliated Carious Bone, we find the under part of it rough and very uneven, which it wou'd not be if it was part of an entire Scale, and we find the ends of Bones after amputations, ſcale almoſt as eaſily as their natural ſurfaces, not quite ſo eaſily, becauſe the longitudinal coheſion of the parts is ſtronger then the lateral.

The texture of the Bones, when firſt form'd, is every where looſe and ſpongy, but as they encreaſe they become in many places very compact and denſe, which reſults in great meaſure from the very frequent if not continual preſſure of the Bellies of the Muſcles, and other incumbent parts, as appears from the Impreſſions which are made on the Surfaces of the Bones, and the rough Spines that riſe on the Bones in the interſtices of the Muſcles, which are very remarkable in the Bones of Men who have been bred up in hard labour: In thoſe parts of the flat Bones that receive but little preſſure, the outer *Laminæ* only, become compact and denſe, and the middle part remains ſpongy; but where the preſſure is great, They become one denſe Body or Table; and this preſſure is ſo effectual, that ſome parts of the *Scapula*, and the middle of the *Ilium*, are thinner in an adult Body than in a Child before it is born. The Cylindrical or round Bones being preſs'd moſt in their middles, become there very hard and Tab. v. D. ſtrong, while their extremities grow ſpongy, and dilate into large Heads, which make ſtronger Joynts, and give more room for the origins and inſertions of the Muſcles, and encreaſe the power of the Muſcles, by removing their Axis farther from the Center of Motion of any Joynt they move; it alſo happens from the denſity of their middles, that they are *ſo much* ſtronger there than towards their extremities, notwithſtanding their diameters are leſs, *as* the middles of the Bones are more expoſed to Injuries than their extremities, which equally ſecures all the parts of a Bone from external accidents.

All the Bones, except ſo much of the Teeth as are out of the Sockets, and thoſe parts of other Bones which are either covered with Cartilage, or where Muſcles or Ligaments ariſe or are inſerted; are covered with a fine Membrane, which upon the Scull is called *Pericranium*, elſewhere *Perioſteum*; the uſe of which is for the Muſcles to ſlide eaſily upon and to hinder them from being lacerated by the roughneſs and hardneſs of the Bones. This Membrane is ſaid to be exceeding ſenſible of pain, which, I ſuppoſe, is imagin'd from the pain that a blow on the Shin gives; but it ſhou'd be conſider'd how much greater the contuſion is in that caſe, from its lying upon a hard Body; for this is certain, that when we cut this Membrane, or ſeparate it from the Bone, as we do, to prepare for the Operation of the Trephine; the Patient never diſcovers any extraordinary uneaſineſs, and that great pain that is felt at the Sawing the Bones or a Bone in an amputation, ariſes from the Teeth of the Saw, tearing the great Nerves that always lie near the Bones, and not from the *Perioſteum*; for if it proceeded from that, the Pain would be at leaſt as great at the firſt, ſetting on of the Saw, or at the laſt Stroke, as at any other time; but the greateſt pain is when the Bone or Bones are ſawed almoſt half, or more then half through, juſt when it comes at the Nerves; which makes the Vulgar think the Pain ariſes from the Sawing of the Marrow, and indeed their Obſervation appears to be more exact, though not more true than the other.

In a Body that I Diſſected, who died of a Spotted Fever, I found in many of the Bones extravaſated Blood, and in ſeveral places, particularly on the *Os Humeri*, and *Os Femoris*, a large quantity of Blood between the *Perioſteum* and the Bones. I imagine it may be from ſuch extravaſations of Blood that carious Bones ſo often follow violent Feavers, and the Small-Pox.

In Children that have died of the Rickets, I have always found the Nodes on the Bones very ſpongy and bloody, and in one inſtance ſeveral of the Bones as limber as Leather, and the *Perioſteum* in many places ten times its natural thickneſs, but the Cartilages in all that I have Diſſected have had no apparent Alteration in their Texture, tho' they were ſwell'd to more than four times their natural bigneſs.

Every Cylindrical Bone has a large middle Cavity, which contains an oily Marrow, and a great number of leſſer Cells towards their extremities, which contain a bloody Marrow; this bloody Marrow is alſo found in all ſpongy Cells of Bones; the uſe of the firſt kind of Marrow is to ſoften and render not brittle the harder Fibres of Bones among which it is ſeated, and the other Marrow is to be of the ſame uſe to the leſs compact Fibres, for an oily Marrow would have made them too ſoft; and for this reaſon, there is leſs of the oily Marrow, and more of the Bloody in young Bones than in old ones; every one of theſe Cells is lined with a fine Membrane and the Marrow in the larger Cells is alſo contained in thin Membranous Veſicles, in which Membranes I ſuppoſe thoſe Veſſels lie that ſecrete the Marrow; and for the Cavities of the Bones they not only contain the Marrow, but, as *Gallileo* has demonſtrated, encreaſe the ſtrength of the Bones, juſt as much as their Diameters, which is about a third part, without encreaſing their weight; which Structure being more advantagious to Birds, eſpecially in their Wings, then to other Animals, theſe Cavities in them are remarkably large. But in a fractured Bone, in which the ſame kind of matter that oſſified the Bones at firſt, is thrown out from the ends of the broken Bone, there is made one ſolid Maſs of Callous Matter, of equal ſolidity with any part of the Bone, and of equal or greater Diameter; which will make the ſtrength of the Bone in that place proportional to the ſquare of the Diameter; which will be more than a third part ſtronger than it was before; and if we conſider, we ſhall find this a very wiſe proviſion, for Bones when broke are ſeldom or never ſet in ſo good a direction as that in which they were firſt formed, and therefore they would be more liable to be broke in the ſame place again, and would be reunited with very great difficulty, and ſometimes not at all, becauſe the Callous not being vaſcular would ſcarce admit the oſſific matter to flow through it to form a new Callous.

CHAP. II.

Of the Articulations of the Bones.

THE Names of the Articulations of the Bones being variouſly uſed by Authors, and being but of ſmall Conſequence, I ſhall here give the ſhorteſt Account that I can of them. An Articulation for manifeſt Motion is called *Diarthroſis*, for obſcure Motion *Synchondroſis*, and that kind which is without Motion *Synarthroſis*.

DIARTHROSIS, is divided into two kinds, *viz. Enarthroſis* and *Ginglymus*. *Enarthroſis* is where a round Head is received into a round Cavity, which Mechanicks call the Ball and Socket, though none of the Articulations in a humane Body fully reſemble that, unleſs the upper end of the Thigh Bone, with the *Os innominatum*. *Ginglymus* is always deſcribed by Authors to be where a Bone receives and is receiv'd, which is right where they are join'd ſomewhat like hinges, as the oblique Proceſſes of the *Vertebræ* of the Loins, where Authors always take two Joynts to make a *Ginglymus*, that it may anſwer their Deſcription, tho' any one of thoſe Joynts is a true *Ginglymus*. But in the other *Vertebræ*, and in the Articulation of the *Ulna*, with the *Os Humeri*, and that of the *Radius* with the *Ulna*, there being only the motion of hinges without the form to give theſe Joynts this denomination; we may for the ſame reaſon call every Joynt a *Ginglymus*, whoſe Property is only to bend and extend, as the Knee, Ankle, &c. and what makes it more neceſſary to bring theſe Joynts under this Head, is, that they are reduceable to no other.

SYNCHONDROSIS, is us'd for all obſcure Motions, as the Motions of the Bones of the *Carpus* and *Tarſus* among themſelves, tho' the term ſignifies only that kind of obſcure Motion that is where Bones are joyn'd by intervening Cartilages or Ligaments, as between the Bodies of the

Vertebræ, but the trueſt *Synchondroſis* is the joyning of the Ribs to the Bone of the *Sternum*.

SYNARTHROSIS, is of two ſorts, *viz. Sutura* and *Gomphoſis*, the firſt kind is the mutual Indentation of one Bone with another, as is eminently ſeen in the Scull, and the other the faſtening of the Teeth in their Sockets like a Nail in Wood.

CHAP. III.

Of the Sutures *and* Bones *of the* Head.

THOSE SUTURES which have proper Names, are here deſcribed; thoſe which have not, derive their Names from the Bones they ſurround, and are known by them.

SUTURA CORONALIS, runs a-croſs the Scull, and joyns the Parietal Bones to the Frontal. Tab. iii. 1.

SUTURA SAGITTALIS, joyns the Parietal Bones; it begins at the *Os Occipitis*, and is continued to the *Os Frontis*; in Children down to the Noſe, the *Os Frontis* in them being two Bones, and ſometimes ſo in adult Bodies. Tab. iii. 2.

SUTURA LAMBDOIDALIS, joins the back part of the *Oſſa Bregmatis* or Parietal Bones to the upper part of the Occipital Bone: In this Suture are frequently obſerved ſmall Bones, call'd *Oſſa Triquetra*. Tab. iii. 3. Tab. iii. 29.

SUTURA

Tab. iii. 4. SUTURA SQUAMOSA, is the wrapping of the upper part of the Temporal and Sphenoidal Bones over the lower Edges of the Parietal Bones.

Tab. iii. 5. SUTURA TRANSVERSALIS, runs a-croſs the Face thro' the bottoms of the Orbits of the Eyes, it joins the lower Edge of the Frontal Bone to the *Os Sphenoides*, *Maxillæ Superioris*, *Oſſa Unguia*, *Palati*, *Plana*, and *Zygomata*, or *Malarum*.

The Scull being thus divided into many Bones, is neither ſo ſubject to Fractures, nor to have Fractures ſo far extended, as it wou'd have been were it compos'd of one Bone only. This Structure is alſo convenient for the Oſſification of the Bones (as has been ſhewn in the firſt Chapter) and for the Birth, becauſe theſe Bones not being perfect at that time, wrap over one another and make the Head leſs.

Ten of the Bones of the Head compoſe the Scull to contain the Brain. Theſe ſhall be firſt deſcribed.

Tab. iii. 7. OSSA PARIETALIA or BREGMATIS, are two large Bones, which compoſe the ſuperiour and lateral Parts of the Scull: On the inſide they are remarkably imprinted by the Arteries of the *Dura Mater*.

Tab. iii. 6. OS FRONTIS, makes the upper and forepart of the *Cranium*; its lower part compoſes the upper parts of the Orbits of the Eyes; on its inſide are impreſs'd the external figure of the two Hemiſpheres of the Brain; in thin Sculls this Bone always has a large thin Spine in the middle of the inſide, running from the *Os Ethmoides* towards the Crown of the Head, but in thick Sculls it is always wanting, and in very thick ones it has a Sinus in its place; the uſe of this Spine is to ſtrengthen thin Sculls. Immediately above the *Os Ethmoides*, in this Bone is a ſmall blind Hole thro' which runs a Vein into the beginning of the Longitudinal *Sinus* of the *Dura Mater*; under the Eye-brows, near the Noſe, in this Bone are two large *Sinuſes* which lead into the Noſe, and on the upper edge of each Orbit, a ſmall Perforation, or a Notch through which Nerves and an Artery paſs ſecure to the Forehead. The Sinuſes and Spine in this Bone make it very dangerous, if not impracticable, to apply a Trephine on the middle and lower part of the Forehead.

OS ETHMOIDES OR CRIBRIFORME, is a ſmall Bone about two Inches in circumference, ſeated in the anterior part of the Baſis of the Scull, being almoſt ſurrounded by the laſt deſcrib'd Bone; it is full of Holes like a Sieve. In its middle ariſes a large Proceſs nam'd *Criſta Galli.* The greater part of the *Laminæ ſpongioſæ* in the Noſe, belong to this Bone.

OS SPHENOIDES, is of a very irregular Figure; it is ſeated in the middle of the Baſis of the Scull, bounded on its fore-part by the Frontal and Ethmoidal Bones, ſideways by the Parietal and Temporal Bones, and backward by the *Oſſa Petroſa* and Occipital Bone. In its inſide next the Tab. iii. 14.

Brain is a Cavity, nam'd *Sella Turcica*, which is bounded by four Proceſſes call'd *Clinoides.* On the outſide of the Scull adjoining to the Upper Jaw, are Two Proceſſes of this Bone on each ſide, nam'd *Pterygoides*, from which ariſe One on each ſide near the Palate, having no Name; over which are reflected the Tendons of the *Pterygoſtaphalini externi* Muſcles, and nearer towards the *Occiput*, between theſe and the *Styloid* Proceſſes of the *Oſſa Petroſa*, ariſe Two more ſmall rugged Proceſſes, and under the *Sella Turcica* in this Bone, is a *Sinus* which opens into the Noſe. At the inſide of the Baſis of the Two anterior Clinoid Proceſſes are Two round Holes, which are the First *Foramina* of the Scull; through theſe the Optick Nerves paſs; almoſt under theſe towards the Sides of the Scull, are two irregular Slits, nam'd *Foramina lacera*, or the Second *Foramina* of the Scull, through which paſs Nerves and Blood-Veſſels into the Orbits of the Eyes; and under theſe towards the *Occiput* are Two round Holes, which are the Third *Foramina*, thro' which paſs Nerves to the Face; about half an Inch nearer the *Occiput*, are Two more of an oval figure, which are the Fourth *Foramina*, thro' which paſs the largeſt Branches of the Fifth pair of Nerves; and a Straw's breadth farther Two very ſmall ones, call'd the Fifth *Foramina*, thro' which thoſe Branches of the Carotid Arteries enter that are beſtow'd upon the *Dura mater.* Theſe ſmall Arteries have been

Tab. iv. B. 10.

Tab. iv. B. 11.

Tab. iv. 12.

een miſtaken for Nerves. Between this laſt
eſcrib'd Bone and the *Oſſa Petroſa*, are two
arge rough holes, not commonly deſcrib'd, in Tab. iv. 13.
hich I have ſeen large Veins; and from theſe
oles thro' part of the *Os Sphenoides*, under
he Pterygoid Proceſſes are ſmall holes obſerv'd
y Dr. *Douglas*, thro' which paſs Nerves and
rteries to the back part of the Noſe.

OSSA TEMPORUM, are ſituated below the Tab. iii. 9.
arietal Bones, at the middle and lower parts
f the ſides of the Scull; they have each at
heir back-parts, one large Proceſs, call'd *Mam-*
illaris, or *Maſtoideus*, and from the lower and Tab. iii. 10.
iddle parts of each a Proceſs which joins the
ſſa Malarum; nam'd *Jugalis* or *Zygomaticus*. Tab. iii. 13.

OSSA PETROSA, lie between the former
ones and the Occipital Bones, or are truly
ortions of the former Bones, being never
ound ſeparate in adult Bodies. They have each
n their outſide One long ſlender Proceſs, call'd
tyliformis, and from the ſide of this Proceſs a Tab. iii. 12.
oramen, which runs obliquely forwards into
he Scull; theſe are the Sixth *Foramina*; and Tab. iv. B. 5.
ne *Foramen* in the inſide of the Scull leading
o the Organs of Hearing, which are the Se-
enth *Foramina*. The ridge on the upper parts
f each of theſe Bones in the inſide of the Scull,
s alſo one on each ſide rais'd by the *Os Frontis*
nd *Sphenoides*, help to keep the Brain ſteady,
See Chapter of the Dura Mater) and are admi-
rable

rable ſupports to the thin and flat parts of the Scull, which elſe wou'd be exceeding weak. (For what remains of this Bone, ſee Chap. *Of the Organs of Hearing.*)

Between the laſt deſcrib'd Bones, and the following Bone, are Two large Holes, which are Tab. iv. 14. the Eighth *Foramina.* Thro' theſe Holes paſs the *Par vagum* and *Lateral* Sinuſes; ſometimes there are two on each ſide, one for the Nerve and one for the Sinus. To theſe we may add another very ſmall One on each ſide, thro' which paſs the *Portiones duræ* of the Auditory Nerves; and ſometimes there is another for an Artery.

Os Occipitis, makes all the back-part of the Scull, it is bounded by the Sphenoidal, Temporal, Petroſal, and Parietal Bones; it has two ſmall *Apophyſes*, by which it is articulated to the Spine; near thoſe *Apophyſes* are two ſmall *Foramina*, which are the Ninth of the Scull, thro' theſe paſs the Ninth pair of Nerves; and between theſe is the great, or Tenth *Foramen*, Tab. iv. B. 15. thro' which the *Medulla oblongata* deſcends into the Spine, the Cervical Arteries enter, and the Cervical Veins and tenth pair of Nerves paſs out. In the inſide of this Bone is a crucial Spine impreſs'd by the Longitudinal and Lateral *Sinuſes*; and on the outſide oppoſite to the middle of this Spine, in ſome Bodies, is an *Apophyſis*, and from that down to the great *Foramen*, a ſmall thin Spine. The Spines in this Bone are of the ſame uſe with thoſe in the *Os*

Frontis, &c. *viz.* to ſtrengthen it, which they do here in a greater degree than in any other Bone of the Scull. The thinner parts of this Bone are alſo defended by the Muſcles that cover them. This extraordinary Proviſion is very neceſſary, becauſe we can leaſt defend this part, and blows here are of worſe Conſequence than on any other part of the Scull, becauſe Wounds in the *Cerebellum*, which is underneath, are Mortal.

I have obſerv'd in moſt Sculls, a *Foramen* behind each *Apophyſis* of the Occipital Bone to the Eighth *Foramen*; through which paſs Sinuſes, from the lateral Sinus's, to the external cervical Veins: By means of theſe Communications, as in all other Communications of the Sinus's, the Blood paſſes from thoſe that happen to be ſurcharg'd by any Poſture of the Head, into thoſe that from the ſame Poſture wou'd elſe have been almoſt empty. Such Sculls as want theſe *Foramina*, have two Sinuſes for the ſame purpoſe within the Scull.

The remaining Bones of the Head compoſe the Face, Orbits of the Eyes, and the Jaws.

OSSA NASI, are ſmall oblong Bones which make the upper part of the Noſe; they make that kind of arch which is fitteſt to ſuſtain ſuch Injuries as the Noſe is moſt expoſed to. Tab. iii. 16.

OSSA MALARUM, theſe Bones compoſe the Cheeks, and the anterior, lower and outer parts of the Orbits of the Eyes; they have each a Tab. iii. 15.

ſhort

ſhort Proceſs, which Proceſſes join the *Proceſſus Jugales* of the Temporal Bones, and form Arches, which, by ſome Authors, have been call'd *Oſſa Jugalia.*

Tab. iii. 17. OSSA UNGUES, are ſmall Bones about as large as Thumb Nails, ſeated immediately below the Os *Frontis* towards the Noſe in the Orbits of the Eyes, whoſe anterior and inner parts they help to Compoſe. To theſe belong ſome of the *Lamellæ* in the Noſe; and between Tab. iii. 19. each of them and the upper Jaw is a *Foramen* as large as a Gooſe Quill, into which the *Puncta Lacrymalia* lead to carry off any ſuperfluous moiſture from the Eyes into the Noſe.

Tab. iii. 18. OSSA PLANA, are thin ſmooth Bones ſeated immediately beyond the foregoing Bones, in the Orbits of the Eyes, and are near thrice as big. To theſe alſo belong ſome of the *Lamellæ* in the inſide of the Noſe.

Tab. iii. 20. MAXILLA SUPERIOR is always deſcrib'd ſingle, though it is manifeſtly divided by a Suture which I have never ſeen wholly obliterated. It runs up with two Proceſſes to the *Os Frontis* between the *Oſſa Naſi* and *Ungues.* Its upper and outer parts make the lower parts of the Orbits of the Eyes, its lower ſide, all that part of the Face under the Cheeks, Eyes and Noſe to the Mouth, and two Thirds of the Roof of the Mouth. A little below the Orbits Tab. iii. 21. of the Eyes, in this Bone, are two Holes, and behind the *Dentes Inſciſores* one more, which divides into two, as it opens into the Noſe, one on each ſide the *Septum Naſi.* Between the Poſterior Grinding-Teeth and the Orbits of the Eyes are two great Sinus's, called *Antra Maxillæ ſuperioris.* They communicate with the Noſe; and in the lower Edge of this Jaw are the *Alveoli*, or Sockets for the Teeth. The Sides of theſe Cavities, as alſo thoſe in the Sphenoidal and Frontal Bones that lie next the Noſe, are only Membranes which make the Caveties like Drums, to give a grave Sound to the Voice when we let Part of it through the Noſe; but Brutes not needing ſuch Variety of Sounds, have all theſe Spaces fill'd with *Lamellæ*, which are covered with Membranes in which the Olfactory Nerves terminate, for a more exquiſite Senſe of Smelling, which is not neceſſary for Men.

I have ſeen an Impoſthumation from rotten Teeth in one of theſe Cavities, which has been cur'd by drawing ſome of the laſt Grinding-Teeth, and by making a Perforation into it through their Sockets. Mr. *Cowper* has admirably deſcribed this Caſe. The Signs of it are rotten Teeth, ſtinking Breath, and great Pain about the Part: The drawing one or two of the laſt Grinding-Teeth, generally, if not always, in this Caſe, opens a Paſſage into the *Antrum*; but if not, or if the Paſſage is not large enough, it may be made, or enlarg'd with a Carpenter's penter's Nail-Piercer or Gimblet, which is as good an Inſtrument as can be for the Purpoſe.

OSSA PALATI, are two ſmall Bones that make the back Part of the Roof of the Mouth, and a ſmall Part of the Bottom of each Orbit, unleſs theſe Portions may be accounted diſtinct Bones. Between the *Oſſa Palati* and the Pterygoid Proceſſes of the Sphenoidal-Bone are two ſmall Foramina, through which Arteries and Nerves paſs to the Palate.

OS VOMER, is ſeated between the Bones of the Palate, and the Sphenoidal Bone. Its Fore-Part is ſpongy, and is continued to the middle Cartilage of the Noſe. This Bone and Cartilage are the *Septum Naſi*.

OS SPONGIOSUM, is always treated as a diſtinct Bone, tho' it is only the ſpongy *Laminæ* in the Noſe, of the *Ethmoides*, *Ungues*, *Plana* and *Maxilla Superior*, but chiefly the *Ethmoides*. In conſidering this as a diſtinct Bone, we follow the Method of the Ancients who did not diſtinguiſh the Bones of the Skull only as they are divided by Sutures, but according to the Differences of their Texture, Figure, Scituation, or Uſe. Thus they called theſe Parts, *Os Spongioſum*, a Proceſs of the temporal Bone, joined to the *Os malæ*, *Os Jugale*; the temporal Bone which is one with the *Petroſum* in Adults, *Os temporis*, becauſe it is ſeated under the Temples. And the other Part *Os petroſum*, from its Hardneſs or Ruggedneſs, and the upper Jaw one Bone, though it is always two.

Maxilla Inferior, is articulated with looſe intervening Cartilages to the temporal Bones, by two Proceſſes, named *Condyloides.* Near theſe ariſe two more, very acute, called *Coronales*, and at the Inſide of the Chin a ſmall rough *Proceſſus Innominatus*. In the Inſide of this Bone under each *Proceſſus Coronalis*, is a large *Foramen* which runs under the Teeth through this Bone, and paſſes out at the Chin. In this *Foramen* or Channel, the Veſſels paſs that belong to the Teeth, and in the upper Edge of this Jaw are the *Alveoli*, or Sockets for the Teeth. Tab. iii. 22. Tab. iii. 24. Tab. iii. 23. Tab. iii. 25.

Dentes, the Teeth ſeldom exceed Sixteen in each Jaw, the Four Firſt in each are called *Inſciſores*, the Two next *Canini*, and all the reſt *Molares*. The Four laſt of theſe are named *Dentes Sapientiæ*, becauſe they do not appear till Men arrive at Years of Diſcretion. The *Inſciſores* and *Canini* have only one ſingle Root, but the *Molares* more, the Eight firſt, Two; and the reſt, ſome Three, ſome Four, eſpecially in the upper Jaw, becauſe the upper Jaw being more ſpongy than the other, the Teeth need more Fangs to fix them. Each of theſe Fangs, or Roots, has a *Foramen*, through which paſs an Artery, Vein, and Nerve; which are expanded in a fine Membrane lining a Cavity in Tab. iii.

in each Root of a Tooth. This Membrane is the Seat of the Tooth-Ach.

The Teeth of Men caſt off, and don't change entirely while they are growing; the ſucceeding ones always riſing larger than the former, for the Jaws encreaſing faſter than the Teeth, muſt otherwiſe of Neceſſity have left Chaſms between 'em, ſuch as there are in the Mouths of Brutes; but whenever an entire Tooth is drawn, the Socket cloſes, and none ſucceeds.

I extirpated a Tumor from a Woman's Cheek about as large as a Hen's Egg, which was judg'd Schirrous; but when I cut near the middle of its Baſis, there came out a large Quantity of Lympid Matter, and upon ſearching with a Probe, I found the *Os Malæ*, part of both Jaws, and the *Os Sphenoides* at the Baſis of the Skull, Carious, which being impracticable to exfoliate, I endeavour'd to heal the Wound, which I did to a very ſmall Compaſs, but could not quite, becauſe of the Gleet which came from the Bones, till I made a Paſſage from the Inſide of the Mouth to it, and turned the Matter that Way; and after, about Three Months, this Paſſage alſo cloſed, and then the Cavity began to fill again, and in two Years Time grew as large as before. Then I made an opening into the Mouth, and diſcharg'd the Matter with but little Trouble; ſince that Time it has fill'd in Two or Three Months Time; ſometimes it breaks of it ſelf into to her Mouth, and ſometimes I launch it. When I conſider this, and the many Bones I have found Carious in dead Bodies, without any Mark of Diſorder in the fleſhy Parts, ſome of which I have known the Perſons, when living, have never complain'd of, I cannot but think (tho' it is the beſt Practice if it can be done ſafely to exfoliate a *Caries*) that there is not ſo great Neceſſity of doing it, as is commonly believ'd.

CHAP. IV.

Of the BONES *of the* TRUNK.

THE Bones of the Trunk are thoſe which compoſe the Spine or Chain of Bones from the Head down to the Rump, the Ribs and *Sternum*.

THE SPINE, is compoſed of Twenty Four *Vertebræ*, (each of which in a young Child is Three Bones) beſides thoſe of the *Os Sacrum* and *Coccygis*; ſeven belong to the Neck, the firſt of which is called *Atlas*, the Second *Dentata*, from a Proceſs in that Bone bearing the ſame Name: Twelve to the Back, Five to the Loins. The *Os Sacrum* is ſometimes Five, ſometimes Six Bones, and the *Os Coccygis* Four. If this Chain had been compos'd of fewer Bones, they muſt have either not been capable of bending ſo much as they do, or have bent at leſs obtuſe Angles, which wou'd have preſs'd the Spinal Marrow. Tab. i. ii. Tab. iv. G. Tab. iv. H. 1.

Tab. IV. H, I, K. In all theſe *Vertebræ*, except the firſt, is a
1. middle Anterior Spongy Body, by which they
are firmly articulated with a very ſtrong intervening Ligament, and from the Middle of
the hind Part of each except the firſt, ſtands a
4. Proceſs nam'd *Spinalis*, and from every one a
2. Proceſs on each Side, called *Tranſverſalis*, and
two ſuperior, and two inferior ſhort ones, by
which the back Parts of the *Vertebræ* are articu-
3. lated, nam'd *Obliqui*, *Superiores*, and *Inferiores*.

The Fore Part of the Seven *Vertebræ* of the Neck, and two upper of the Back, are flat forwards, to make Room for the *Aſpera Arteria* and *Gula*: the Third and Fourth of the Back very acute, to give way to the Diviſion of the Veſſels of the *Lungs* and *Heart*, which makes that Side of the Breaſt ſomewhat more convex than the other, and therefore ſtronger, which is an Advantage to the right Arm, becauſe its Motions depend upon the Support it receives from the Breaſt; beſides, the right Arm, by Reaſon of this Curve, will be nearer the Axis of that Part of the Spine which lies below the Arm, and therefore better ſupported by the Spine. Hence, I think, it appears that the almoſt univerſal Preference of that Arm is not an arbitrary thing, but founded upon right Obſervation, that it is capable of more perfect Actions than the other.

The Spinal Proceſſes of the Second, Third, Fourth and Fifth *Vertebræ* of the Neck are forked, the two laſt of the Neck long and horizontal, the Three or Four upper ones of the Back like them, only a little declining, the middle ones of the Back run obliquely downwards, and the Proceſſes of the remaining *Vertebræ* become ſucceſſively thicker, ſtronger, and leſs declining; thoſe of the Loins being Horizontal, like the laſt of the Neck. The Muſcles that are inſerted into the ſpinal Proceſſes of the *Vertebræ* of the Neck and Loins, will act at more Advantage than thoſe of the Back, becauſe their Proceſſes being perpendicular to the Spine, they are longer Leavers; beſides, thoſe of the Back touch one another, and prevent much Motion, becauſe it would interrupt Reſpiration; and much Motion being neceſſary in the Neck and Loins, their Proceſſes are made fit for it.

The tranſverſe Proceſſes of the *Vertebræ* of the Neck are perforated, for the Admiſſion of the Cervical Blood-Veſſels, and bowed downwards, and hollowed, for the Paſſage of the Cervical Nerves. The Eight or Nine upper ones of the Back, receive the upper Ribs; and the reſt, with thoſe of the Loins, ſerve only for Origins and Inſertions of Muſcles. The Shape of the Spine is like an *Italick ſ* bending inwards at the Loins, and outwards at the Shoulders; therefore when Women that are either very young or very weakly, breed, the Child by a continued Preſſure againſt the Loins, makes them ſtreighter, which neceſſarily makes the Shoulders or Back ſo much more convex, and the Preſſure upon the Abdominal Muſcles at the ſame Time bringing the Ribs downwards, they grow round-ſhouldered and flat-breaſted.

Tab. ii. 13. OS SACRUM has two upper oblique Proceſſes, ſome ſmall ſpinal Proceſſes, and two *Foramina* in each Interſtice of the Bones it is compoſed of, both before and behind.

Tab. ii. 14. OS COCCYGIS has none of theſe Parts.

Through every Bone of the Spine, the *Os Coccygis* excepted, is a large *Foramen*, which, together make a Chanel through the Spine, in which is contained the *Medulla Spinalis*; and in each Space between the *Vertebræ* are two large Holes for the Nerves to paſs out.

'Tis worth conſidering, the wonderful Proviſion *Nature* has made to prevent Luxations in this Chain of Bones. In the Neck the oblique Proceſſes of the receiv'd Bone are wrap'd over thoſe of the receiving Bone, which forbids their Luxating forwards. The tranſverſe Proceſſes with a ſmall *Apophyſis* of the Body of the ſame Bone, in like Manner ſecures them from ſlipping backwards, and an *Apophyſis* on each Side of the Body of the receiving Bone, hinders them from ſlipping to either Side. The *Vertebræ* of the Back are hinder'd from diſlocating forwards by the ſame Proviſion with thoſe of the Neck; and from Luxating backwards, by the Ribs which are faſten'd to the tranſverſe Proceſſes

ceſſes of the inferior *Vertebræ*, and againſt the Back-part of the Body of the next ſuperior; they alſo hinder 'em from diſlocating to either Side; but the Ribs at the two or three laſt *Vertebræ* of the Back are not fix'd to the tranſverſe Proceſſes, and therefore it is that Luxations are moſt frequently ſeen in this Part; but the *Vertebræ* of the Loins are receiv'd into deep Cavities, and are ty'd with much ſtronger Ligaments for their Security. Each Joint of the *Vertebræ*, except the two uppermoſt, has two Centers of Motion, one upon the Bodies of the *Vertebræ*, when the Body is bowed forwards; and the other at the Articulations of the oblique Proceſſes, when the Body is bowed backwards; from which Structure the Extenſors will have about twice the Lever to act with, and conſequently twice the Power to raiſe the Trunk into an exect Poſture, that they have to carry it beyond that Poſture; for then the oblique Proceſſes begin to be the Center of Motion, aud give the ſame Advantage to moſt of the Benders. Without this Contrivance it wou'd have been vaſtly difficult, if poſſible, to have kept the Body erect for any Length of Time, or to have recovered an erect Poſture with conſiderable Strength or Quickneſs after a Bend of the Body.

The RIBS are Twelve in Number on each Side; the Seven uppermoſt are called True Ribs, becauſe their Cartilages reach the *Sternum*; and the Tab. {i. ii.

the Five loweſt are called Baſtard-Ribs. They are articulated to the Twelve *Vertebræ* of the Back. They defend the Parts contained in the Breaſt, and when they are drawn upwards, the Cavity of the Breaſt is enlarg'd for Inſpiration, and ſo the contrary. In two Children which I have diſſected, I found the Ribs broke inwards, and on the outſide a plain Print of a Thumb and Four Fingers, which had been made by their Nurſes hoiſting them up on one Hand, taking hold of their Breaſts, which being very often repeated, had broke the Ribs inwards like a green Stick, without ſeparating the broken Ends of them; and I have very frequently ſeen the Shape of Childrens Breaſts quite ſpoiled by ſuch Tricks, which has occaſion'd Weakneſs of Body, Crookedneſs, and other Diſeaſes.

Tab. i. 2. STERNUM, or Breaſt-Bone, is generally made up of Three Bones, to this the True Ribs are articulated by their Cartilages.

Tab. iv. C. OS HYOIDES (I chooſe to mention it in this Place, becauſe I know none more proper among the Bones) is a ſmall Bone at the Root of the Tongue; it ſerves only for Muſcles to ariſe from, and be inſerted into. It is made of Three Bones, the middle one is called *Baſis*, 1.
the other *Cornua*. 2.

I have ſeldom found fewer than Four and Twenty *Vertebræ* in the Spine, beſides the *Os Sacrum*, but often more; ſometimes Thirteen of the Back, with as many Ribs of a Side;

and ſometimes Six in the Loyns: And in ſome Bodies Two Ribs from the firſt *Vertebræ* of the Loyns; but then it has wanted tranſverſe Proceſſes.

CHAP. V.
Of the BONES *of the Upper Limbs.*

CLAVICULA, is of the Figure of the Italick *ſ*, one End is articulated to the *Sternum*, and the other to the *Proceſſus Acromion* of the *Scapula*; it ſerves to fix the *Scapula*, and to determine its Motions. This Bone is oſſified as early as any Bone in the Body, and is the ſooneſt united, when broken. Tab. {i. 3. ii. 3.

SCAPULA, its Parts are the *Acetabulum*, which is a ſhallow Cavity to receive the *Os Humeri*: A large Spine from whoſe Fore-Part ſtands a Proceſs call'd *Acromion*, and another Proceſs from the Fore-part of the upper Edge of the *Scapula* nam'd *Coracoides*; its upper Edge is nam'd *Coſta ſuperior*, and its lower one *Coſta inferior*, and the poſterior Edge its *Baſis*. I have ſeen a *Scapula* of a Man which Dr. *Douglaſs* diſſected, in which the Inſide of the *Acetabulum Scapulæ* was broke all to Pieces, and the *Os Humeri* diſplac'd, which Fracture, I believe, cou'd not by any Means be certainly known while the Man was living, or if it cou'd have been known, cou'd not have been cured; yet I doubt Tab. ii. 4. Tab. ii. 5.

doubt not but the Surgeon, whoever he was, did not eſcape Cenſure for not making a Cure.

Whenever the *Proceſſus Acromion* is broke, the Arm can never after be raiſed to Advantage; for no Care of the moſt skilful Surgeon can reduce ſuch a Fracture; for the Deltoid Muſcle will draw the Ends of the broken Proceſs aſunder, and will want a middle fix'd Place to act from.

Tab. { i. 5. ii. 6. Os Humeri, this Bone has at its upper End a round Head for its Articulation, and near that an *Apophyſis*, which is divided by a *Sulcus*, in which runs a Tendon of the *Biceps flexor Cubiti.* At its lower End are two *Apophyſes*, named the outer and inner. Between theſe *Apophyſes* on the Fore-Part of the Bone, is a ſmall *Sinus*, which receives a Protuberance of the *Ulna*, and behind a large and deep one, which receives the *Olecranon* of the *Ulna.* This Bone being more liable to be broke by a Blow than any other Way, and it being uncertain where that ſhall fall, it is made of almoſt equal Strength through the whole Length of it; and its lower End having a very ſmall Joint, for the ſake of a quick Motion, the Sinus's are form'd there, to receive the Proceſſes of the *Ulna*, to prevent Diſlocations.

Tab. { i. 7. ii. 8. Ulna, at its Articulation to the former Bone has two Proceſſes, one large and thick,
Tab. ii. 9. named *Olecranon*, and one ſmall one, named

Proceſſus anterior, and at the lower End of this Bone is a ſmall Proceſs, named *Styloides*.

When about two Inches or leſs of this Bone is broke off at the lower End, it is ſcarce poſſible to raiſe it into its Natural Situation till the Arm be turned prone; becauſe in a ſupine Poſture the Tendon of the *Tenſor Ulnaris* rides over it and preſſes it down.

RADIUS, is received at the upper End by the *Os Humeri* and *Ulna*; at its lower End it receives the *Ulna* and *Carpus*. By its turning upon the *Ulna*, are performed the Prone and Supine Motions of the Cubit. About an Inch below its upper End is an Extuberance for the Inſertion of the *Biceps* Muſcle. Tab. { i. 6. ii. 7.

CARPUS, the Wriſt, is compos'd of Eight Bones of irregular Figure; they are diſtinguiſhed into Four of the firſt Order, and Four of the ſecond. The two firſt of the firſt Order are articulated with the *Radius*, the firſt of the ſecond Order is articulated to the Thumb, and the remaining three to the Metacarpal Bones. The inſide of theſe Bones leave a ſemilunar Cavity for the Tendons of the Muſcles which bend the Thumb and Fingers to paſs through. What other Reaſons there may be for this particular Compoſition of Bones, I know not; but this is plain, that by being moveable, one among another, they gradually give way, and leſſen the Shock which any Force againſt the Tab. iv. M. 1, 2, 3, 4, 5, 6, 7, 8.

the Hand wou'd give, as the Box of Springs does the jolting of a Coach, and thereby make the Force leſs in each Moment of Time upon every Bone of the Arm, which greatly preſerves them from breaking; and the Shoulder's being fixed by Muſcles, contributes very much to this Purpoſe. This is an Advantage that cannot be exactly computed; but it is certainly very great.

Tab. iv. M. 9. METACARPUS, is compoſed of Four Bones.

Tab. iv. M. 10. POLLEX, the Thumb is made of Three Bones.

Tab. iv. M. 11. DIGITI, The Fingers are each compoſed of Three Bones. For the Figure of theſe, ſee the Table, which will give a better Idea of them than a verbal Deſcription.

CHAP. VI.

Of the BONES *of the lower Limbs.*

Tab {i. 11. ii. 12.} OS INNOMINATUM, is, before Puberty, compoſed of Three Bones; the uppermoſt is named *Ilium*, the lower and anterior *Os Pubis*, the lower and poſterior *Os Iſchii*. The upper Edge of the *Ilium* is called its Spine, the anterior Part of the Spine its *Apex*, and lower than this is the *Proceſſus Innominatus*. The *Iſchium* has Two Proceſſes, the one called *Acutus*,

cutus, the other *Obtuſus*. In the Center of theſe Bones is the *Acetabulum*, or Socket, to receive the Thigh-Bone; in the Bottom of which Socket is another Cavity, in which lies the lubricating Gland of this Joynt; and between the
Os Iſchium and *Os Pubis*, is a large *Foramen*. Tab. i. 19.

Os Femoris, at its upper End has a round Tab. i. 12.
Head, which is receiv'd into the *Acetabulum* of
the *Os Innominatum*. A ſmall diſtance from
this are two Proceſſes, nam'd *Trochanter major*, Tab. i. 13. ii. 17.
and *Trochanter minor*. The Space between the Tab. ii. 17.
greater Proceſs and the Head of this Bone, is call'd its Neck, and from the leſſer *Trochanter* down the back-part of this Bone till within Four or Five Inches of the lower End, is a Ridge, call'd *Linea Aſpera*. At the lower End of this Bone are two *Apophyſes*, one exterior, and one interior. The chief Uſe of the *Linea Aſpera* is, to ſtrengthen the Thigh-Bone; it is therefore ſo ordered, that it is always large, proportionably to the Bend of the Thigh-Bone, and largeſt in that Part of every Thigh-Bone that is moſt bent.

In two Bodies which I have Diſſected, I have
found this Bone broke at its Neck, and by that Tab. vi.
means the Limb ſhorten'd, and the Caſe miſta- G, H.
ken for a Luxation of the Hip; and if we conſider the depth of this Articulation, and the wonderful ſtrength both of the Muſcles and Ligaments, we cannot but ſuſpect that this Bone is much oftner ſo broke, than out. This

is certain, that if by an external Accident the Thigh is made ſhorter, and yet is uſeful, that muſt needs be from a Fracture, and not a Diſlocation; for it cannot be, that the Head of the Thigh-Bone ſhou'd form it ſelf a Socket among the Muſcles, to bear the whole Weight of the Body: Or ſuppoſing this cou'd happen, tho' it is contrary to what we know, in other like Caſes, yet even then we muſt have new Muſcles made, or theſe we have altered; for their Directions with the Thigh-Bone being changed, their Uſes wou'd too, and almoſt all pull to the Side contrary to which the Bone is Diſlocated.

It often happens, that from a Flux of Humours upon the Hip, this Joynt appears Diſlocated; for when it is attended with Pain, the Muſcles contracting alter the Poſture of the Limb, and make it appear ſhorter, as the Limb which is lifted from the Ground is when we ſtand on one Leg: But if the Fluxion is without Pain, the Muſcles relax, and the Limb falls into the ſame Figure, which that Limb is in, which we ſtand on in that Poſture, and appears longer; which makes the common way of comparing of the Limbs a very uncertain, if not impoſſible way to diſcover the Caſe; therefore to know certainly, apply a ſtraight Rule from the Apex of the Spine of one Hip to that of the other, then from the Middle of that Rule draw a perpendicular Line between the Legs;

then meaſure the Limbs at that Line in the ſame Plane, and if their Lengths are equal, they are moſt certainly right.

Patella, the Knee-Pan is ſeated upon the Tab. i. 14. Joynt of the Knee; its Uſe is for the Extenſors of the *Tibia* to be inſerted into, leaſt paſſing over that Joynt, they might be too much expoſed to external Injuries; it alſo gives an Advantage to the Muſcles, by removing their Axis farther from the Center of Motion of the Knee.

Tibia, the Shin-Bone is in its middle almoſt Tab. {i. 15. ii. 18. triangular, which it ſeems to owe to the Preſſure of the Muſcles, for it is Cylindrical in a *Fœtus*. In its upper End are two ſhallow Sockets, between which is a Proceſs for the croſs Ligament of the Knee to ariſe from; a little below its Head is another Proceſs, to which the Ligament of the *Patella* is fixed, and at its lower End another, which makes the inner Ankle.

A Boy of ſeven Years old was brought to me with both the *Epiphyſes* at the upper Ends of the *Tibiæ*, ſo far ſeparated from the *Tibiæ*, that not more than half each *Tibia* was joined to half the *Epiphyſis*, which made the Legs wholly uſeleſs. This had been occaſioned by the Nurſe holding him out to Stool by the Heels and Back, when very young, which is among them too common a Practice. I Diſſected the Leg of a Man that had broke the *Tibia* through the Fleſh, by a Fall from the Top of a Houſe; no Extention that was made mov'd this compound Fracture at all, which I afterwards found to be occaſion'd by a ſimple tranſverſe Fracture above, which always gave way to the Extenſion; that Bit of Bone whoſe End came thro' the Skin, being diſcontinued from the Parts by which the Extenſion was made. In the Foot of the ſame Leg, Four of the Bones of the *Tarſus* were crack'd, two more of them, *viz.* the *Os Calcis* and *Naviculare*, had large Pieces ſeparated, which were broke into a Maſh; and all this without any Diſlocation among theſe Bones, or any the leaſt external Wound or Bruiſe.

Tab.} i.16. ii.19. FIBULA, is a long ſmall Bone, its upper End is articulated to the outſide of the *Tibia*, an Inch below its Joynt, and the lower End makes the outer Ankle, and part of that Joynt; Its chief Uſe is for Origins of Muſcles; for it has no ſhare in ſupporting the Body. A Strain of the worſt kind happens often to this Joynt from the mighty Force of the *Peronei* Muſcles, when we endeavour to prevent a Fall; for they being turn'd over the End of the *Fibula*, as on a Pulley, part of their Force lies againſt this Bone, and ſtreins the Ligaments that hold it, and ſometimes the Bone it ſelf is broke by them; which wants no Care to ſet, and can ſeldom be diſcover'd till the Swelling is fallen.

Tab. iv.I., 1, 2, 3, 4, 5, 6, 7. TARSUS, is made up of Seven Bones, which are call'd *Aſtragalus*, *Os Calcis*, *Naviculare*, *Cuboides*,

boides, *Cuneiforme majus*, *Medium*, and *Minimum.* The Bones of the *Tarſus* have the ſame kind of elaſtick Structure with thoſe of the *Carpus*, and for the ſame Ends, but in a much greater Degree; becauſe here the whole Body is ſuſtain'd. This Sort of Contrivance, and the Uſe of it, are both very evident in the laſt Joynts or Paſterns of the Legs of Horſes; for Horſes that have long Paſterns, and much elaſtick Motion in them, muſt neceſſarily trot high, and yet they always trot eaſie; but a Horſe with ſhort Paſterns, that trots high, always trots hard.

METATARSUS, is compos'd of Four Bones. Tab. iv. L 8.

POLLEX PEDIS, is compoſed of Three Bones. Tab. iv. L, 9.

DIGITI PEDIS, each is compos'd of Three Bones, but the two laſt of the little Toe often grow into one. Tab. iv. L, 10.

For the Figure and Situation of theſe Bones, ſee the Table.

OSSA SESAMOIDEA, are ſaid to be found to the Number of Forty-eight: But we commonly find no more in the Feet than two under the Ball of each great Toe; and in the Tab. iv. D. Hands ſometimes two very ſmall ones at the middle Joynt of each Thumb; and ſometimes Tab. iv. E. one at the lower End of each Thigh-Bone at the Beginning of the *Plantaris* Muſcle. Their Tab. iv. F. Uſe is the ſame with the *Patella.*

I find alſo in ſome Bodies the little Cartilages at the receiving Ends of the Bones of the Fingers oſſified; which thoſe Authors have reckon'd among the *Seſamoid* Bones; who, ſay they, are found to the Number of Forty-eight.

CHAP. VII.

Of the CARTILAGES.

EVERY Part of a Bone which is articulated to another Bone for a ſliding Motion, is cover'd or lin'd with a Cartilage, as far as it moves upon, or is mov'd upon by another Bone in any Action; for Cartilage being ſmoother and ſofter than Bone, it renders the Motions more eaſy than they would have been, and prevents the Bones wearing each other in their Actions. Theſe Cartilages in the largeſt Joynts, are as thick as a Shilling, and in the ſmalleſt, as thin as Paper.

In the forepart of each Articulation of the lower Jaw, there is a looſe Cartilage upon which the Condyloid Proceſs moves on one Side, while the Jaw is mov'd to the other; and the two Proceſſes being thus rais'd at once, the Jaw is thruſt forward.

In the Joynt of the Knee are two looſe, almoſt anular Cartilages, which being thick at their outer Edges, and thin at their inner ones, they make the greateſt parts of the two Sockets in this Joynt. The uſe of theſe Cartilages is to make variable Sockets to ſuit the different parts of the lower end of the *Os Femoris*, for none but a round Head and a round Cavity can ſuit in Motion, unleſs the ſhape of one or the other alters; and it is plainly neceſſary, that this lower end of the *Os Femoris* ſhou'd be flattiſh, and projected backward, to give advantage to the Muſcles that extend the *Tibia*, by ſetting the center of Motion backward; which Mechaniſm, tho' it equally leſſens the Power of thoſe Muſcles which bend this Joynt, is yet of great Service, becauſe the extending Muſcles move this Joynt under the Weight of the whole Body, but the Flexors only raiſe the Leg; and as no Head and Socket move ſo eaſily as round ones, here is proviſion made againſt the inconvenience of a flattiſh Head and Cavity, by having the Friction made upon two Surfaces, the *Os Femoris* upon the looſe Cartilages, and the looſe Cartilages upon the *Tibia*. This Contrivance is always found neceſſary by Mechanicks, where the Friction of the Joynts of any of their Machines is great, as between the parts of Hook-hinges of heavy Gates, and between the Male and Female Screws of large Vices, where they always place a looſe Ring.

There are other Cartilages which ſerve to give ſhape to Parts. Of this Sort are the Ciliary Cartilages at the Edges of the Eye-lids, the Cartilages of the outer Ears, and thoſe which compoſe the lower part of the Noſe; which have this particular Advantage in theſe Places, that they ſupport and ſhape the Parts as well as Bones cou'd do, without being liable to be broke.

Tab. i. 20. The Ribs have Cartilages of a conſiderable length, which articulate the Seven uppermoſt, and ſometimes Eight on each ſide to the *Sternum*; which Cartilages being very pliable, ſuffer the Ribs to move eaſily in Reſpiration, and the Body to twiſt or bend to either ſide without difficulty. But the Cartilages of the lower Ribs do not reach the *Sternum*. And at the bottom of the *Os Pectoris* or *Sternum*, is a Cartilage which is nam'd from its commoneſt Figure, Tab. i. 21. *Enſiformis*.

There are other Cartilages which compoſe the *Larynx* and *Aſpera Arteria*. The *Larynx* is form'd of Five: The foremoſt is like a Saddle, but is nam'd *Thyroides*, behind this are Two call'd *Arytænoides*; they compoſe the *Rimula* of the *Larynx*. Over theſe is the *Epiglottis* to cover the *Rimula* while the Aliment paſſes to the *Pharynx*; and under them One like a Seal Ring, nam'd *Cricoides*. The Cartilages which compoſe the *Aſpera Arteria*, or remaining part of the Wind-pipe, are not quite Annular, but connected by Membranes at their back-part, to give way to the Aliment deſcending thro' the *Pharynx*.

There are other Parts that Authors call Cartilages, which I rather chuſe to rank with the Ligaments: And therefore will deſcribe them in that Chapter, as thoſe between the Bodies of the *Vertebræ*, &c.

I have ſeveral times found ſupernumerary Cartilages from the *Sternum*, running between the Ribs; and frequently the *Cartilago Enſiformis* double. I do not remember that I have ever ſeen a Cartilage ſcale like a Bone or Slough like ſofter Parts, tho' I have often ſeen them eat thro' by Matter that has been collected in a Joynt, which has ſometimes occaſion'd the Bones to grow together. Tab. vi. E.

CHAP. VIII.

Of the LIGAMENTS.

EVERY Bone that is articulated to another for Motion, is ty'd to that it moves upon, by a Ligament, whoſe thickneſs and ſtrength always bears a proportion to the quantity of Motion in the Joynt, and the force with which it is liable to be exerted; and the length of the Ligament is never more then is ſufficient to allow a proper quantity of Motion.

The Bones of the Limbs that move to all Sides, have Ligaments like Purſes, which ariſe from or near the Edges of the Sockets of the receiving Bones, and are inſerted all round the receiv'd Bones, a little below their Heads.

The beginnings of theſe Ligaments from the edges of the Sockets of the *Scapula* and *Os Innominatum* are very hard, almoſt Cartilaginous, which ſerves in the *Scapula*, to make a larger Socket, and ſuch a one as will alter its Figure as the Bone moves, for the reaſon that I have mention'd in the looſe Cartilages of the Knee; for the Head of the *Os Humeri* is a Segment of too large a Sphere to fit any but a variable Socket of ſo ſmall a ſize, in ſuch a quantity of Motion as is in that Joynt; and the hard part of this Ligament of the Socket of the *Os Innominatum* makes the Socket deeper then the Semidiameter of the Socket, without any hindrance to Motion, becauſe it will give way to the neck of the *Os Femoris*, when it preſſes againſt it.

The Ligaments of thoſe Articulations which admit only of Flexion and Extenſion, differ from the former in this only; That they are much ſhorter and ſtronger at the ſides of the Joynts, and thinner backward and forward.

At the upper part of the Articulation of the *Os Femoris* and *Os Innominatum*, is a ſtrong Ligament of great Conſequence; it contributing very much to preſerve that Joynt from being luxated by the weight of the Body. And from the lower Edge of the *Acetabulum* of the *Os Innominatum*, runs a Ligament to the middle of the Head of the *Os Femoris*, about two Inches long (which the Motion in this Joynt requires) call'd *Teres*, or *Rotundum*, whoſe Uſe is to prevent the *Os Femoris* from being luxated upwards, but downwards it will let it go far out of the Socket; which fully ſhows, that in Men it is particularly contriv'd to prevent the Thigh-bone from being diſlocated upwards; but in Brutes the head of the *Os Femoris* being oblong, and the Cavity ſuitable, there can be very little more then that kind of Motion which is call'd Bending and Extending; and that never removing the end of the Head of the Bone far in the Socket; a ſhort Ligament is enough for that, and will better keep the Bone in its place, and therefore it is that theirs is ſo ſhort; this Ligament in Men alſo ſerves to preſs the Gland in the bottom of the *Acetabulum* or Socket.

Towards the great *Foramen* of the *Oſſa Innominata* the *Acetabulum* has a deep Notch, from one ſide of which to the other, runs a Ligament, which I have ſeen Oſſify'd. Such a Ligament there is alſo running from one Proceſs of the *Scapula* to the other, which hinders the *Os Humeri* from diſlocating upward.

In the middle and back-part of the Joynt of the Knee are two very ſtrong Ligaments which ariſe from a Proceſs at the end of the *Tibia*;

they croſs each other in ſuch a manner, as is beſt to ſecure the Joynt from being diſplac'd any way; they alſo hinder the extenſors of the *Tibia* from pulling that Bone too far forwards.

All the Bodies of the *Vertebræ*, and every Joynt that is without Motion, and not joyn'd by a Suture, as the *Oſſa Innominata* with each other, and the *Os Sacrum* with the *Oſſa Innominata*, are all joyn'd by intervening Ligaments, commonly call'd Cartilages.

The *Proceſſus Dentatus* of the ſecond *Vertebra*, is tied to the Scull by a Ligament, and kept cloſe to the forepart of the firſt *Vertebra* by another, in that *Vertebra*, that it may not bruiſe the Spinal Marrow; and when either this Ligament or Proceſs is broke, it makes that ſort of broken Neck which is attended with ſudden Death.

The Bones of the *Carpus* and *Tarſus* are ty'd together by Ligaments running promiſcuouſly upon their Surfaces from one to another, which at the under ſide of the *Tarſus* are vaſtly ſtrong, becauſe they ſupport the whole Body. There is alſo to the *Carpus*, a ſtrong Ligament which runs from the Fifth Bone to the Eighth, and the Proceſs of the Fourth Bone. The proper Uſe of this is, to bind down the Tendons of the Muſcles that bend the Fingers.

The *Os Hyoides* to the *Proceſſus Styliformis* of the *Os Petroſum*; the *Patella* to the *Tibia*, and the Seſamoid Bones in their places, are all ty'd by Ligaments.

From the Edge of the *Ilium* to that of the *Os Pubis*, runs a Ligament which is contiguous to, and appears to be a part of, the Tendons of the oblique Muſcles of the *Abdomen*; its uſe is to cover the Iliack Veſſels as they deſcend to the Thigh: Under this Ligament, together with the Veſſels, I have often met with a Rupture of Matter, and, I think, ſometimes the Gut, (however I dare affirm that to be a poſſible Caſe) from the *Abdomen* into the anterior part of the Thigh immediately below the Groin. Such Caſes are well worth the Obſervation of Surgeons; becauſe Opening ſuch Tumors may be of very bad Conſequence.

The Tendons of all the Muſcles that are not involv'd in Fat, are either ty'd down to the Bones they paſs over, by Ligaments which contain a lubricating *Mucus*, or have ſometimes communications with the Joynt they move: As has been curiouſly obſerv'd by Dr. *Douglaſs*, particularly in the Joynt of the Hip. The Uſe of theſe Ligaments is to confine them to their proper Directions, and contain the *Mucus* that lubricates their Surfaces, to make their Motions more eaſy.

From the *Tibia* to the *Fibula*, and from the *Ulna* to the *Radius*, are tranſverſe Ligaments which help to keep theſe Bones together, and give Origins to a great many Muſcles. There is another of this Sort in the great *Foramen* of the *Os Innominatum*; and One between the *Os Sacrum* and Proceſſes of the *Os Iſchii*; and ſome more in the Body, too ſmall to have a particular Account given of them in this Place.

Authors agree, That the Ligaments are inſenſible; and give for their Reaſon, That they wou'd elſe be injur'd by ordinary Motions. But the ALL-WISE is a better Architect! For none of 'em, except thoſe which lie between the Bones, are ſubject to Attrition; and thoſe they have call'd Cartilages. I do not think that theſe laſt are ſenſible; but the other I have had frequent Experience are capable of very acute Pains, there being not any thing our Patients more grievouſly complain of, than collections of Matter within theſe Parts, or ſharp Medicines apply'd to 'em when laid bare.

CHAP. IX.

Of the Lubricating GLANDS *of the Joynts.*

EVERY Joynt, where the Bones are fac'd with a Cartilage for a ſliding Motion, is furniſh'd with ſmall Glands which ſeparate a mucilaginous Matter for the lubricating of the

Ends of the Bones, that they may move eaſily upon one another; and that there may be no waſt of this neceſſary Fluid, it is contain'd in the inveſting Ligaments, which for this very reaſon are no where divided, except to communicate with the Ligaments of Tendons.

Theſe Glands are generally ſeated near the inſertions of the Ligaments, that they may be compreſs'd by them when the Joynts are in Motion, which is a proper time to have their fluid preſs'd out.

There is One large Gland of this Sort, ſeated in a *Sinus* at the bottom of the *Acetabulum* of the *Os Innominatum*, which is compreſs'd by the *Ligamentum Teres*. The other Glands are ſo ſmall, even in the largeſt Joynts, that they can ſcarce be diſcern'd with the naked Eye; but with a Microſcope they may be ſeen in great plenty in the Place before mention'd.

When from violent Bruiſes, or any other Cauſe, theſe Glands are Ulcerated, they throw off a corroſive Matter, which erodes the Cartilages of the Bones 'till it inſinuates itſelf into their ſpongy Heads, and renders their whole ſubſtance Carious. When this Diſeaſe happens to the Hip, in time it makes its way thro' the Ligament, becauſe the Socket in that Joynt is depending; and then it gets under the *Gluteus Maximus* to the outſide of the Thigh under the flat Tendon of the *Faſcialis* Muſcle, and ſometimes to the forepart of the

Thigh, where the great Blood-Veſſels run: In this Caſe, which is very rare, I apprehend that the ſurrounding Ligament is perforated before as was mentioned in the laſt Chapter. These Caſes are generally, if not always, incurable.

The Number of the BONES being very different at different Ages, more then thrice the Number in young Children, (counting the *Epiphyſes* diſtinct Bones) that they are in adult Bodies, and being different in Number in different young Bodies of the ſame Age, becauſe the Bones in ſome unite much earlier than in others; I have made this Scheme, according to the natural Diviſions, from a Body as ſoon as fully Grown, at which time the Number of the Bones are the ſame in moſt Bodies: But the Number of Cartilages, Ligaments and Glands of the Joynts is unaſſignable.

Os vel Oſſa		Os vel Oſſa	
Parietalia	2	*Sternum*	
Frontis	1	*Hyoides*	
Ethmoides	1	*Claviculæ*	
Sphenoides	2	*Scapulæ*	
Temporum	2	*Humerorum*	
Petroſa		*Ulnæ*	2
Auditoria	8	*Radii*	
Occipitis	1	*Carporum*	1
Naſi	2	*Metacarporum*	
Malarum	2	*Pollicium*	
Ungues	2	*Digitorum*	24
Plana	2	*Innominata*	
Maxillæ ſuperior	2	*Femorum*	
Palati	1	*Patellæ*	
Vomer	1	*Tibiæ*	
Spongioſum	0	*Fibulæ*	
Maxilla inferior	1	*Tarſorum*	1
Dentes	32	*Metatarſorum*	1
Vertebræ	24	*Digitorum Pedis*	2
Sacrum	6	*Seſamoidea*	
Coccygis	4		
Coſtæ	24	Total	25

A CASE of a Fractur'd Scull, in a Girl Nine Years of Age. *Vide Tab.* XI.

THIS Girl being brought into the Hoſpital the 27*th* of *May*, Seven Days after the Scull was Fractur'd, having had all that Time very bad Symptoms. I immediately open'd the Scalp, and let out about Two Ounces of Grumous Blood, and laid the Scull bare about Four Inches one way, and Three the other; and tied the Blood Veſſels, that I might make the Operation without much difficulty, the next Morning. The Fracture extended a-croſs the *Os Bregmatis*, from the Sagittal Suture, to the Temporal Bone; that part next the *Os Frontis* was depreſs'd equal to its thickneſs, and a great deal of extravaſated Blood, partly turn'd to Matter, lay under the other part of the ſame Bone. I made Two Perforations with the Trephine, cloſe to the Fracture, that I might raiſe it up ſteadily thro' both, and have more room for the extravaſated Blood to diſcharge from under the Scull; which had diſcharg'd before in great quantity through the Fracture. But neverthe leſs Ten Days after the former Operation, I was oblig'd to make another Perforation, to diſcharge the Matter more freely; for during a Month, the Matter ran through all her dreſſings down her Face, twice every day, and was exceeding Fœtid; and for the ſpace of Five Months the Matter decreas'd very little in quantity, but grew leſs and leſs offenſive, 'till *September* the 13*th*, when the leaſt of the Bones was taken out; and on *September* the 29*th*, the large one; after which time the Matter was good, and not too much in quantity. Both theſe Bones are through both Tables, for the Motion in the Brain was ſeen; and beſides theſe, there were many little bits of Bone came away in the Dreſſings; but the Cure not being yet finiſh'd, I can ſay no more about it.

To this Caſe I'll add another, of an old Man, who having had the under part of the *Os Calcis* laid bare, as large as a Half Crown, by a Mortification, and being brought to the Hoſpital, about Two Years after the Bone was firſt bare, and all endeavours to ſcale it having prov'd in vain, I par'd it with a Chiſſel, 'till the Bone bled, and it cover'd with Granules of Fleſh in about Three Days, and afterwards Heal'd very eaſily.

BOOK II.

CHAP. I.

Introduction to the Muſcles.

THE Muſcles are moving Powers, or Cords, apply'd to perform the ſeveral Motions of the Body; which they do by contracting their length; and thereby bringing the Parts to which they are fix'd nearer together. The immoveable or leaſt mov'd part any Muſcle is fix'd to, is call'd its Origin, and the other its Inſertion; but Muſcles that have their two Ends equally liable to be mov'd, may have either call'd their Origins or Inſertions.

Each Muſcle is apparently made of a number of ſmall Fibres, which are generally ſuppos'd (and by ſome affirm'd from Microſcopical Obſervations) to be Strings of ſmall Bladders, which being diſtended contract the Muſcle, and being emptied ſuffer it to relax: But ſuppoſing this is the Structure, which I think is highly probable, it yet remains a Secret how theſe Bladders are ſo ſuddenly diſtended: The Influx of Blood we are ſure is not ſufficient, and what the Nerves do we know not; but we find by Experiments, that the Artery or Nerve of a Muſcle being divided, that Muſcle wholly looſes its Motion; which clearly ſhows, they are both neceſſary to that Motion; but what ſhare each has in it, whether they each bring a Fluid, (if the Nerves have a Fluid) which being mix'd, expands and produces this effect, (as appears moſt likely to me) or whether it is done by ſome other means, is not yet determin'd. It is certain, that if theſe Bladders were diſtended with Blood only, a Muſcle could act with no more Moment in any given time than there is in the Blood of the Artery that ſerves it; which would not be enough to ſupport the Body, or give it a viſible Motion; nor will the ſmallneſs of the ſize of the Bladders, of which the Fibres of a Muſcle are compos'd, at all anſwer this Objection, for whatever Moment one Bladder, whoſe Diameter is an Inch, will have in a given time, from the Force by which the Arterial Blood is preſs'd into it, a thouſand Bladders, the ſum of whoſe Cubes are equal to the Cube of that one, will from the ſame given Force act with but the ſame Moment, however they are conſtructed; and though a Hundred Bladders conſtituting one String or Fibre, will raiſe a weight as high as one Bladder, whoſe Diameter is equal to the Diameter of the Hundred taken together, yet the one Bladder will raiſe Ten thouſand times more weight than the Hundred can, and not one String or Fibre, but Ten thouſand ſuch Strings of Bladders will produce a Moment equal to the one Bladder; and they together will be equal in bulk to the one Bladder: Or it would be eaſy from ſuch Mechaniſm to contrive a *Per- etuum Mobile* of prodigious Force (*See* Tab. VIII.) If the Diſtention of theſe Bladders is made by any kind of Exploſion or Expanſion of a Fluid (which is the only kind of Pow- r that exceeds Mechanick Laws, which we are cquainted with), and if this Expanſion is made y the mixture of two Fluids, the ſmallneſs of heſe Bladders ſeem plainly neceſſary, that the luids which are to be expanded, may be the etter and more ſuddenly mix'd.

The quickneſs and quantity of Motion in a luſcle will be, *cæteris paribus*, as the length of s Fibres; for if a Fibre four Inches long will con- act one Inch in a given time, a Fibre eight nches long will contract two Inches in the ſame me, and the ſtrength of a Muſcle or Power to iſe a Weight, *cæteris paribus*, will be as the num- r of its Fibres; for if one Fibre will raiſe a Grain eight, twenty Fibres will raiſe twenty Grains.

The Muſcles are of two Sorts, *viz. Rectili- al* and *Penniforme*; the former have their bres parallel or almoſt parallel in the ſame or ar the ſame direction, with the Axis of the uſcle, and the latter have their Fibres join'd in an oblique direction, to a Tendon paſſing in or near their Axis, or on their outſides.

The Rectilineal Muſcles, if their Origins and Inſertions are in little compaſs, are never of any conſiderable thickneſs, unleſs they are very long, becauſe the outer Fibres wou'd compreſs the inner ones, and make them almoſt uſeleſs; and therefore every Rectilineal Muſcle, whoſe inner Fibres are compreſs'd by the outer, have their inner Fibres longer than the external, that they may be capable of equal quantity of Contraction; for the Bladders which compoſe the inner Fibres not being capable of being diſtended as much as thoſe which compoſe the outer ones, they muſt, to have equal motion, be longer than the outer, in a reciprocal proportion to the degrees of their Contractions.

The Penniforme Muſcles, tho' they are in a manner free from the inconvenience of one Fibre compreſſing another, and tho' by the Obliquity of their Fibres, nothing is abated of their Moment, as is clearly demonſtrated (*See* Tab. xxxi.) by an Experiment of Mr. *Hawksbee*'s; where it is ſhown, that in all Caſes, juſt ſo much more weight as Rectilineal Fibres will raiſe than Oblique ones, the Oblique ones will move their weight with juſt ſo much greater Velocity than the Rectilineal; which is making their Moments equal; yet the Fibres of the Penniforme Muſcles becoming more and more Oblique as they contract, their Strength decreaſes, and their Velocity increaſes, which makes them leſs uniform in their actions than the Rectilineal Muſcles; wherefore it ſeems that Nature never uſes a Penniforme Muſcle where a Rectilineal Muſcle can be uſed; and the Caſes in which a Rectilineal Muſcle cannot be uſed, are where the ſhape of a Muſcle is ſuch as that the inward Fibres wou'd be too much compreſs'd, and where Rectilineal Fibres could not have a *Lever* to act with, ſuitable to their quantity of Contraction, which is the caſe of all the long Muſcles of the Fingers and Toes; for every Muſcle muſt be inſerted or paſs over the Center of Motion of the Joynt it moves, at a diſtance, proportionable to its quantity of Contraction, and the quantity of Motion in the Joynt mov'd; for if it was inſerted too near, then the Motion of the Joynt would be perform'd before the Muſcle is contracted all that it can; if too far off, the Muſcle will have done contracting before the whole Motion of the Joynt is made: So that two Muſcles of equal magnitude, one Long, and the other Short, will both move the ſame Weight with the ſame Velocity when applied to a Bone; becauſe the *Levers* they act with muſt be as their Lengths, and therefore the Penniforme and ſhort thick Muſcles are never made for the ſake of Strength, nor long Fibred Muſcles for Quickneſs; for whatever is gain'd by the form of the Muſcle, whether Strength or Quickneſs, muſt be loſt by their inſertions into the Bone, or elſe the Muſcles muſt not act all they can, or the Bones have leſs Motion than they are fitted for.

In the Limbs ſeveral Muſcles paſs over two Joynts, both of which they are liable to move at once, with Force proportionable to the Levers they act with upon each Joynt; but either Joynt being fix'd by an Antagoniſt Muſcle, the whole Force of ſuch Muſcles will be exerted upon the other Joynt, which in that Caſe may be mov'd with a Velocity equal to what is in both Joynts, when theſe Muſcles act upon both at once. This Mechaniſm is of great uſe in the Limbs, as I ſhall ſhow in the proper Places.

CHAP. II.

Of the MEMBRANES *of the* MUSCLES.

MEMBRANÆ MUSCULORUM. All the External Muſcles are either cover'd with a ſtrong tendinous Expanſion, or with a thin lax Membrane, and ſome with both. The former is either the flat Tendon of ſome other Muſcle or Muſcles, as may be obſerv'd upon the *Abdomen* and Loyns, or a *Faſcia* detach'd from the Tendons of other Muſcles, as may be ſeen in the Limbs, or not deriv'd from any, as may be obſerved upon the *Infraſpinati* of the *Scapulæ*. Moſt of the other are of the latter Sort; but thoſe that adhere to the the Skin, as in the Face, have only a *Membrana adipoſa*. The interior Muſcles, and the under-ſide of the exterior ones, have only a looſe Membrane for the moſt part, or in thoſe whoſe Surfaces do not touch each other, little more than a *Membrana adipoſa*.

CHAP. III.

Of the MUSCLES.

Muſcles of the *Abdomen.* Tab. ix. 9.

OBLIQUUS DESCENDENS, ariſes fleſhy from near the Extremities of the eight inferior Ribs, the upper part of its Origin being indented with the *Serratus major anticus*, and the lower laying under a ſmall portion of the *Latiſſimus Dorſi*; it is inſerted fleſhy into the upper part of the Spine of the *Ilium*, and by a broad flat Tendon (which firmly adheres to a like Tendon of the following Muſcle as they paſs over the *Rectus*) into the *Os Pubis*, and *Linea alba*, which is a ſtrong tendinous Line extended from the *Os Pubis* to the *Sternum*, between the *Muſculi Recti*.

OBLIQUUS ASCENDENS, ariſes fleſhy under the former Muſcle from the Spine of the *Ilium*, and is inſerted fleſhy into the Cartilages of the Three loweſt Ribs, and by a flat Tendon into the *Sternum* and *Linea alba*, together with the Tendon of the foregoing Muſcle; the line in which theſe two Tendons joyn on the out-ſide of the *Rectus* Muſcle, is call'd *Semilunaris* : And tho'

tho' ſo much of this Muſcle as is inſerted fleſhy runs obliquely upward, yet the middle and lower part is directed tranſverſe and downward; and beſide the Tendon which it unites with the *Obliquus deſcendens*, it often detaches another near the *Sternum* to be inſerted with the *Tranſverſalis* under the *Rectus*.

Tab. ix. 11. PYRAMIDALIS, ariſes from the *Os Pubis*, and is inſerted into the *Linea alba* about three or four Inches below the Navel: This and its fellow are often wanting.

Tab. ix. 10. RECTUS, ariſes ſomewhat tendinous from the *Os Pubis*; but fleſhy when the *Pyramidales* are wanting, and is inſerted into the lower part of the *Sternum* near the *Cartilago Enſiformis*. This Muſcle is divided into four or five portions by tranſverſe tendinous Interſections, that it might not preſs the contain'd Parts only in one Place; but theſe Interſections are chiefly above the Navel, a larger Belly being convenient below to ſupport the *Viſcera*.

TRANSVERSALIS, ariſes by a flat Tendon from the tranſverſe Proceſſes of the lumbal *Vertebræ*, and fleſhy from the in-ſide of the Ribs below the Diaphragm, and from the Spine of the *Ilium*, then becoming a flat Tendon, it paſſes under the *Rectus* to its Inſertion into the *Linea alba*. Between this Tendon and the *Peritoneum*, Water is often found in great quantities. This Diſtemper Authors call the Dropſy in the Duplicature of the *Peritoneum*; which clearly ſhows, that they miſtook this Tendon for part of the *Peritoneum*.

Theſe five Pair of Muſcles all conſpire to compreſs the Parts contain'd in the *Abdomen*. The *Obliquus deſcendens* on the Right Side, and *Aſcendens* on the Left acting together, turn the upper part of the Trunk of the Body towards the Left, & *vice verſa*; but the Trunk of the Body is chiefly turn'd upon the Thighs; the *Recti* bend the Body forward, and pull the *Sternum* downward in Expiration; the Two oblique Muſcles and the Tranſverſe on each ſide near the Groins, are perforated to let thro' the *Proceſſus Vaginalis*, with the Spermatick Veſſels. Theſe Perforations are diſtant from each other, ſo as to ſuffer the Veſſels to deſcend conveniently into the *Scrotum*; this way the Inteſtines or the *Omentum*, deſcend in Ruptures. A Man whom I cut for a Rupture in the Hoſpital, had the *Ilium*, and *Omentum* both in the *Scrotum*, together with a great quantity of Water; the *Ilium* I eaſily reduc'd through a large Aperture which I made in the *Abdomen*; but the *Omentum* having been long in the *Scrotum*, adher'd to it; I cut it off, firſt tying it cloſe to the *Abdomen*, to ſecure the Blood Veſſels. After he was recover'd, the *Ileum* would ſometimes preſent it ſelf as far as the place where the Ligature was made, on the *Omentum*, without much Inconvenience, but no farther, being hinder'd by the Cicatrix.

CRE-

Muſcles of the *Teſtes.*

CREMASTER TESTIS, is a ſmall portion of Fibres which ariſes from the *Ilium*, and appears to be part of the *Obliquus Aſcendens* Muſcle, till it meets with the Spermatick Veſſels at their coming out of the *Abdomen*, where it begins to deſcend with them by the ſide of the *Proceſſus vaginalis*, to the Teſticle, over which it is looſely expanded. This Muſcle is too ſmall to be plainly diſcover'd in Emaciated Bodies.

Muſcles of the *Penis.*

ERECTOR PENIS, ariſes from the *Os Iſchium*, and is inſerted into the *Crus Penis* near the *Os Pubis*: It is ſaid, by preſſing the *Penis* againſt the *Os Pubis*, to compreſs the *Vena Ipſius Penis*, and hinder the reflux of Blood, whereby the *Penis* becomes extended and erect, but it does not appear to me to be well contriv'd for that uſe.

ACCELERATOR URINÆ; This, with its fellow, are but One Muſcle; it ariſes Tendinous from the *Oſſa Iſchia*, and fleſhy from the *Sphincter Ani*, and thence being Expanded over the Bulb of the *Urethra*; it afterwards divides, and is inſerted into the *Penis*. The uſe of this Muſcle is not to accelerate the Urine, for that is propell'd by the *Detruſor Urinæ*, or Muſcular Coat of the Bladder, but to eject the *Semen*, which is done only by this; and it being ſeated oppoſite to the *Os Pubis*, it ſeems to be much better fitted to be a relaxer of the *Penis* by pulling it from the *Os Pubis*, than the Erector is for the office aſſigned it.

Muſcles of the Bladder.

SPHINCTER VESICÆ URINARIÆ, is a ſmall portion of muſcular Fibres, not eaſily to be diſtinguiſh'd, running round the Neck of the Bladder to prevent the involuntary effuſion of Urine.

DETRUSOR URINÆ, is the muſcular Coat of the Bladder; its Fibres are differently diſpos'd; but chiefly terminating in the *Sphincter veſicæ*, whereby it not only preſſes the Urine forward, but when the Bladder is full, becomes an Antagoniſt to the *Sphincter*, acting almoſt at Right Angles.

Here I had fallen into a Miſtake, (for the Correction of which I am oblig'd to Mr. *Bamber*, Lythotomiſt to St. *Bartholomew*'s-*Hoſpital*) in ſuppoſing that in the common Operation for the Stone, the Wound had been made into the Bladder, as in Cutting upon the Gripe. Of this Method I ſhould have ſaid more, but that our preſent Attention is engag'd on another Method firſt practic'd by Mr. *Douglas*, which he has hitherto done with ſuch Succeſs, that I am inclin'd to think it will be found the beſt way. He fills the Bladder with Water, and cuts above the *Os Pubis*, nearly the ſame way as was long ſince deſcribed by *Monſieur Dionis*; but I refer my Reader to Mr. *Douglas*'s own Account.

Muſcles of the *Clitoris*.

ERECTOR CLITORIDIS, ariſes from the *Iſchium*, and is inſerted into the *Crus Clito-*

ridis, like the *Erector Penis* in Men, and is ſaid, to cauſe Erection in the ſame manner.

Muſcles of the *Vagina*. SPHINCTER VAGINÆ, is an Order of Muſcular Fibres intermix'd with Membranous Fibres ſurrounding the *Vagina Uteri* near its Orifice; it is connected to the *Oſſa Pubis* and *Sphincter Ani*; its Uſe is to conſtringe the Orifice of the *Vagina*, to preſs out a Liquor from the Glands of the *Vagina*, and embrace the *Penis* in coition.

Muſcles of the *Anus*. SPHINCTOR ANI, is a Muſcle near two Inches in breadth, ſurrounding the *Anus* to cloſe it, and to prevent involuntary falling out of the *Fæces*. Part of this Muſcle is connected to the beginning of the *Urethra*, and is by ſome Anatomiſts divided and call'd *Tranſverſalis Penis*.

LEVATOR ANI, ariſes from the inſide of the *Os Pubis*, and *Iſchium*, and is inſerted into the foregoing Muſcle. The Uſe of it is to ſupport and dilate the *Anus* while the Excrement is ejected.

Fiſtula's in *Ano*, that are within this Muſcle, generally run in the Direction of the Gut, and may be laid open into the Gut within the greateſt ſafety; but thoſe that are on the out-ſide of the *Sphincter* cannot be open'd far into the Gut, without totally dividing the *Sphincter*, which, Authors ſay, renders the *Sphincter* ever after uncapable of retaining the Excrement. One inſtance of this kind I have known; but

Mr.

. *Berbeck*, of *York*, an excellent Surgeon, a
n of great Integrity, and particularly fa-
us for this Operation, has aſſur'd me, that
has often been forc'd to divide the *Sphincter*,
ich has made the Patients unable to hold
ir Excrements during their Cure, but the
unds being heal'd, they have retain'd them
well as ever.

Muſcles of the *Os Coccygis.*

COCCYGEUS, ariſes from the acute Proceſs
the *Os Iſchii*, and is inſerted into the *Os Coc-*
is, which it pulls forward.

Muſcles of the *Scalp.* Tab. x. A.

)CCIPITO-FRONTALIS, is a Muſcle
h Four fleſhy Bellies, commonly nam'd
ntales and *Occipitales*; it ariſes behind each
: from the *Os Occipitis*, and ſoon becoming
dinous, paſſes under the Hairy-ſcalp to the
rehead, where it becomes broad and fleſhy,
ering to the Skin, and is inſerted into the
per part of the Orbicular Muſcles of the
e-lids, and by two Proceſſes into the Bones
the Noſe. When this Muſcle acts from the
k-part, it pulls the Skin of the Forehead
ward, and wrinkles it tranſverſe; but when
: fore-part of it acts, it draws the Skin with
: Eye-brows downward, and towards the Noſe
en we Frown. The Tendon of this Muſcle
; been miſtaken for a Membrane, and been
ll'd *Pericranium*, and the true *Pericranium*,
rioſtium.

Muſcles of the Exter-nal Ear.

ELEVATOR AURICULÆ, ariſes by a thin
ndon from the *Occipito-Frontalis*, and is in-
ſerted

ſerted into the upper part of the Ear that connected to the Head.

RETRACTOR AURICULÆ, ariſes by one, tw or three ſmall portions from the Temporal Bon above the Mamillary Proceſs, and is inſerte into the Ear to pull it backward.

Muſcles of the Eye-lids. Tab. x. D.

ORBICULARIS PALPEBRARUM, ſurroun the Eye-lids on the Edge of the Orbit, and fix'd to the *Sutura Tranſverſalis* at the grea Corner of the Eye; it ſhuts the Eye-lid eſpecially in Winking. That part of this Muſcle that lies under the Eye-brow is very muc intermix'd with the *Occipito-Frontalis*, and under it from the *Os Frontis* near the Noſe, ariſes ſmall portion of diſtinct Fibres which end i this Muſcle, and, I think, are a part of it neverthleſs, from the effect of their Actio are not improperly call'd *Muſculus Corrugator*.

CILIARIS, is a very ſmall portion of thi Muſcle, next the Ciliary Cartilages of the Eye-lids.

ELEVATOR PALPEBRÆ SUPERIORIS RECTUS arises from the bottom of the Orbit of the Ey above the Optick Nerve, and is inſerted int the Ciliary Cartilage of the upper Eye-lid b a very thin flat Tendon; it draws the ſuperior Eye-lid up, and inward over the Ball of th Eye.

Muſcles of the Eyes. Tab. x. Q.

ELEVATOR OCULI, ariſes from the bottom of the Orbit, between the Optick Nerve an the foregoing Muſcle, and is inſerted into th upper part of the *Tunica Sclerotis* of the Eye, near the *Cornea*.

DEPRESSOR OCULI, ariſes, and is inſerted directly oppoſite to the laſt deſcrib'd Muſcle. Tab. x. R.

ADDUCTOR OCULI, ariſes from the bottom of the Orbit, near the Optick-Nerve internally, and is inſerted into the *Tunica Sclerotis* on the ſide next the Noſe. Tab. x. S.

ABDUCTOR OCULI, has both its Origin and Inſertion, directly oppoſite to the *Adductor*. Tab. x. T.

OBLIQUUS SUPERIOR SEU TROCHLEARIS, ariſes between the *Elevator* and *Adductor Oculi* at the bottom of the Orbit, thence aſcending by the *Sutura Tranſverſalis*, becomes a round Tendon, which paſſing through a Pulley at the upper and inner part of the Orbit near its Edge, is inſerted near the bottom of the Globe of the Eye, which it pulls upward and inward, and thereby directs the Pupil outward and downward. Tab. x. N. Tab. x. O.

OBLIQUUS INFERIOR, ariſes from the *Os Maxillæ ſuperioris*, at the edge of the Orbit; thence paſſing over the *Depreſſor*, is inſerted near the *Abductor* at the bottom of the Eye, but not ſo low as the Inſertion of the *Obliquus ſuperior*: It turns the Pupil upward and outward. Tab. x. P.

Theſe Muſcles are inſerted with great Advantage to move a ſmall Weight, and are very long, that the Eye may be mov'd with ſufficient quickneſs. The two oblique Muſcles are an Axis to the Motions of the other four, and acting againſt them, (which action is vulgarly call'd ſtraining the Eye) while we look at Objects at a great diſtance ſhorten the Axis of Viſion, or elſe diſtant Objects wou'd be ſeen much more confuſedly than they are; and for this end it is that there are ſix Muſcles thus diſpos'd, when three wou'd be ſufficient to turn the Eye every way, if it was in a fix'd Socket; and it ſeems to me, that while the Muſcles are all thus in action, the ſuperior oblique in each Eye ſets the Pupil further from the Noſe, while the inferior oblique directs it upward; the firſt of which actions is always neceſſary, and the latter generally ſo, when we look with both Eyes at very diſtant Objects; and when the two oblique Muſcles grow weak by Age or Diſeaſe, or ceaſe to act at all, as in paralitick Caſes, and Death, then the Eye ſinks in the Socket.

Muſcles of the Lips. Tab. x. E. SPHINCTER or CONSTRICTOR ORIS, ſurrounds the Mouth about three-fourths of an Inch broad. This Muſcle is very much intermix'd with all the Muſcles that are inſerted into it.

Tab. x. F. ELEVATOR LABII SUPERIORIS PROPRIUS, ariſes from the Bone of the upper Jaw under the anterior and inferior part of the *Orbicularis Palvebrarum*, and paſſing down by the ſide of the Noſe, is inſerted into the upper part of the *Sphincter Oris.* This raiſes the upper Lip, and helps to dilate the Noſtrils.

DEPRESSOR LABII SUPERIORIS PROPRIUS, is a ſmall Muſcle ariſing from the upper Jaw near the *Dentes Inſciſorii*, and is inſerted into the upper part of the Lip and Root of the Cartilages of the Noſe; hence it is alſo a Depreſſor of the Noſe, which action conſtricts the Noſtrils.

DEPRESSOR LABII INFERIORIS PROPRIUS, ariſes broad from the Lower Jaw at the Chin, and is ſoon inſerted into the *Sphincter Oris*; the Order of Fibres in this is not ſo conſpicuous as in the other Muſcles of the Face. Tab. x. I.

ELEVATOR LABII INFERIORIS PROPRIUS, ariſes from the Lower Jaw, near the *Dentes Inſciſorii*, and is inſerted into the lower part of the Lip.

ELEVATOR LABIORUM COMMUNIS, ariſes from a depreſs'd part of the ſuperior *Maxilla* under the middle of the Orbit, and is inſerted into the *Sphincter* Muſcle near the Corner of the Mouth. Tab. x. G.

DEPRESSOR COMMUNIS LABIORUM, ariſes laterally from the Lower Jaw near the Chin, and is inſerted into the *Sphincter*, oppoſite to the former. Tab. x. H.

ZYGOMATICUS, ariſes from the anterior part of the *Os Zygoma* or *Malæ*, and generally derives a Portion of Fibres from the *Orbicularis Palpebrarum*; thence running obliquely downwards, it is inſerted into the *Sphincter* at the Tab. x. K.

the Corner of the Mouth, betwixt the *Elevator communis* and *Buccinator*; it draws the Corner of the Mouth outward and upward. When this Muſcle grows weak, the Corner of the Mouth ſinks, as may be obſerv'd in Old Perſons.

Tab. x. L. BUCCINATOR, ariſes from the *Proceſſus Corone* of the Lower Jaw, and paſſing contiguous to both Jaws, is inſerted into the *Sphincter* Muſcle at the Corner of the Mouth. It ſerves either to force Breath out of the Mouth, or thruſt the Aliment between the Teeth in Maſtication, or to pull the Corner of the Mouth outward.

PLATYSMA MYOIDES, ariſes looſely from over the Pectoral and part of the Deltoid Muſcle, and running obliquely forward, is inſerted into the Chin, and Depreſſor Muſcles of the Lips: This Muſcle being exceeding thin (a mere *Membrana Carnoſa*) ſerves to cover the unequal ſurface of the ſubjacent Muſcles, and render the Neck even; it alſo pulls down the Corner of the Mouth, and from its inſertion at the Chin, may contribute to the pulling down of the Lower Jaw.

Muſcles of the Noſe. RETRACTOR ALÆ NASI, is a very ſmall Muſcle ariſing from the Bone of the Noſe, and is inſerted into the Skin and Cartilage at the ſide of the Noſe.

Muſcles of the *Os Hyoides*. MYLOHYOIDEUS, with its Fellow, may be eſteem'd a Digaſtrick Muſcle: It ariſes from the *Linea Aſpera* on the inſide of the Lower Jaw and *Proceſſus Innominatus*, both ſides meeting at Right Angles in a middle Line upon the following Muſcles. It is inſerted by a ſmall portion of Fibres into the Baſis of the *Os Hyoides*; it moves the Tongue upward and forward, and alſo compreſſes the following Muſcles, whereby they raiſe the Tongue more commodiouſly, and alſo hinders them from drawing the Baſis of the *Os Hyoides* into a Right Line betwixt the Chin and *Sternum* at ſuch times as the *Stylohyoidei* cannot act.

GENIOHYOIDEUS, ariſes from the *Proceſſus Innominatus* of the Lower Jaw, under the foregoing Muſcle, and is inſerted into the Baſis of the *Os Hyoides*, which it pulls upward and forward. This with its Fellow, are for the moſt part but one Muſcle.

STYLOHYOIDEUS, ariſes from the *Proceſſus Styliformis* near its Root, and paſſing contiguous to the Horn of the *Os Hyoides* becomes inſerted laterally into its Baſis: This Muſcle is ſometimes perforated about the middle by the Tendon of the Digaſtrick Muſcle of the Lower Jaw. Its Uſe is, to pull the *Os Hyoides* up and backward.

CORACOHYOIDEUS, ariſes from the upper *Coſta* of the *Scapula* near the *Proceſſus Coracoides*, and paſſing under the *Maſtoideus* Muſcle becomes in that place a round Tendon; thence paſſing almoſt parallel to the following Muſcle, is inſerted Tab. ix.

together with it into the Baſis of the *Os Hyoides*; this draws the *Os Hyoides* downward, and a little backward. I have once ſeen one of theſe Muſcles wanting, and the *Sternohyoideus* ariſing from the middle of the Clavicle on that ſide.

Tab. ix. 4. STERNOHYOIDEUS, ariſes from a roughneſs at the under part of the *Clavicula* near the *Sternum*, and is inſerted into the Baſis of the *Os Hyoides*, to pull it downward.

Muſcles of the Tongue. GENIOGLOSSUS, ariſes from the *Proceſſus Innominatus* of the Lower Jaw, and is inſerted broad into the under part of the Tongue, to pull it up and forward.

CERATOGLOSSUS, ariſes from the Horn of the *Os Hyoides*, and is inſerted laterally into the Tongue near its Root, to pull it downward and forward.

STYLOGLOSSUS, ariſes from the extremity of the *Proceſſus Styliformis*, and is inſerted into the Tongue near the former to pull it up and backward. I have very often found another *Styloid* Muſcle ſo inſerted, that I can't tell whether to call it a Muſcle of the Tongue or *Pharynx*.

The TONGUE is a Muſcle made of Fibres, Longitudinal, Circular and Tranſverſe, which are neceſſary to give it all its Motions.

Muſcles of the *Cartilago Thyroides*. HYOTHYROIDEUS or CERATOTHYROIDEUS, ariſes from the Horn of the *Os Hyoides*, and is inſerted into the lower part of the *Cartilago Thyroides*, to pull it upwward.

STERNOTHYROIDEUS, ariſes from the inſide of the *Sternum*, and is inſerted with the former; it pulls the Thyroid Cartilage directly downward.

CRICOTHYROIDEUS, ariſes from the anterior part of the *Cartilago Cricoides*, and running obliquely upward and outward, is ſoon inſerted into the inſide of the *Cartilago Thyroides*, which it pulls toward the *Cartilago Cricoides.* Both this Muſcle and its Fellow, for the moſt part appear double.

Muſcles of the *Cartilago Arytænoides.*

CRICOARYTÆNOIDEUS POSTICUS, ariſes from the back-part of the *Cartilago Cricoides*, and is inſerted into the *Arytænoides* to pull it backward.

CRICOARYTÆNOIDEUS LATERALIS, ariſes laterally from the *Cartilago Cricoides*, and is inſerted laterally into the *Arytænoides.* This with its Fellow, pull down each Cartilage toward their Origin, and thereby dilate the *Rimula.*

THYROARYTÆNOIDEUS, ariſes from the ſuperior, middle, and inner part of the *Cartilago Thyroides*, and is inſerted with the former into the *Arytænoides* Cartilage to dilate the *Rimula.* Theſe two laſt deſcrib'd Muſcles are not naturally divided, and therefore ought to be accounted but one Muſcle.

ARYTÆNOIDEUS, is one ſingle Muſcle ariſing from one *Arytænoidal* Cartilage, and is inſerted into the other to draw them together, and cloſe the *Rimula.* Theſe few ſmall Muſcles of the Tongue and *Larynx*, with only one Pipe, make a greater variety of Notes and Sounds then can be made by artificial Inſtruments, and that in a manner ſo little underſtood by us, and by Organs ſo little differing from thoſe in Quadrupeds, that for ought we know of them, Brutes are as capable of all theſe Sounds as Men.

Muſcles of the *Pharynx.*

STYLOPHARYNGEUS, ariſes from near the bottom of the *Proceſſus Styloides* of the *Os Petroſum*, and running obliquely downward, is inſerted into the *Pharynx.* This Muſcle with its Fellow, pulls up and dilates the *Pharynx* to receive the Aliment.

ŒSOPHAGEUS, ariſes like a Wing from ſeveral parts of the Scull, Tongue, *Os Hyoides*, the Cricoid and Thyroid Cartilages, and is inſerted into the *Pharynx.* This with its Fellow, conſtringe the *Pharynx*, and preſs the Aliment down the Gullet.

Muſculus Vaginalis Gulæ, is the *Muſcular Coat of the Gula:* Which ſhall be Treated of in the Chapter of the *Ductus Alimentalis.*

PTERYGOPHARYNGEUS, is not a diſtinct Muſcle, but the beginning of the *Pharynx* near the *Proceſſus Pterygoides*, of the Sphenoidal Bone.

Muſcles of the Palate.

PTERYGOSTAPHYLINUS INTERNUS, ariſes from the *Os Petroſum*, near the *Iter ad Palatum*, or *Euſtachian* Tube, and is inſerted into the *Uvula*, which it pulls up while we breath thro' the Mouth or Swallow.

PTERYGOSTAPHYLINUS EXTERNUS, ariſes by
e ſide of the laſt deſcrib'd Muſcle, and is
ſo inſerted near it; but becomes its Anta-
niſt by being reflected on a Pulley, over a
roceſs at the lower part of the Pterygoidal
oceſſes of the Sphenoidal Bone.

The Palate itſelf is alſo a Muſcle beſet
ith Glands; and from the Palate to the
ongue, are a large parcel of Muſcular Fibres,
hich, I believe, have a greater ſhare in bring-
g down the Palate to the Tongue than the
erygoſtaphylinus Externus.

Muſcles of the Lower Jaw.

DIGASTRICUS, ariſes from the *Sinus* of the
amillary Proceſs of the *Os Temporis*, and
om a fleſhy Belly, becoming a round Tendon,
aſſes thro', and ſometimes under the *Stylo-*
oideus Muſcle, and then being ty'd down by
Ligament to the *Os Hyoides*, grows fleſhy,
nd is ſo inſerted into the anterior part of
e Lower Jaw internally: This Muſcle's dire-
ion being alter'd by its being ty'd to the *Os*
yoides, where it makes an Angle, (and not
t its paſſage thro' the *Stylohyoideus*) pulls the
ower Jaw downward with much greater Force
han otherwiſe it cou'd have done.

Tab. x. B.

TEMPORALIS, ariſes from the *Os Frontis*,
arietale, *Sphenoides*, and *Temporis*, and paſ-
ng under the two Proceſſes, by ſome nam'd *Os*
ugale, is inſerted externally into the *Proceſſus*
orone of the Lower Jaw, which it pulls upward.
his Muſcle is cover'd with a ſtrong tendinous
aſcia.

MAS-

Tab. x. C. MASSETER, ariſes from the lower Edge of the *Os Malæ* or *Zygoma*, and its Proceſs, and is inſerted to the outer part of the Angle of the Lower Jaw, which it pulls up and forward This Muſcle is not to be divided from the Temporal without violence, and therefore ſhou'd be deſcrib'd with it as one Muſcle. Theſe two laſt deſcrib'd Muſcles having different Directions, when they act together, make a ſteady Motion in the Diagonal of their Directions.

PTERYGOIDEUS INTERNUS, ariſes from the *Proceſſus Pterygoideus externus*, and from the Sinus between the Pterygoid Proceſſes, and is inſerted internally into the Angle of the Lower Jaw; this acting ſingly, pulls the Jaw up forward and to the contrary ſide.

PTERYGOIDEUS EXTERNUS, ariſes from the *O Maxillare*, and *Os Sphenoides*, near the Root of the external Pterygoid Proceſs, and is inſerted internally to the *Proceſſus Corone* of the Lower Jaw, which it pulls to one ſide.

Muſcle of the *Clavicula*. SUBCLAVIUS, ariſes from the ſuperio part of the *Sternum*, and is inſerted into the inferior part of the middle half of the *Clavicula*. Its Uſe is to ſtrengthen the Articulation of the *Clavicula* with the *Sternum*, tha they may not be ſever'd in the Motions of th *Scapula*.

Muſcles of the *Scapula*. Tab. x. 2. TRAPEZIUS, ariſes from the *Os Occipitis*, and from a *Linea alba Colli*, from the Spina Proceſs of the laſt *Vertebra* of the Neck, an

th

ıe ten uppermoſt of the Back, and from a *inea alba* between all theſe Proceſſes, and is nſerted into one third of the Clavicle next ıe *Scapula*, almoſt all the backpart of the pine of the *Scapula*, and as much of the *Proſſus Acromion* as lies between the Spine of the *capula* and the Clavicle. This Muſcle draws ıe *Scapula* directly backward, and like a *enniforme* Muſcle, has all its oblique Fibres f ſuch a length, as is ſufficient to make their ctions equal to thoſe which lie in the Directin of the Axis of the Muſcle.

It has been ſaid by all Authors, that the ſeeral parts of this Muſcle act at different times, nd ſo pull the *Scapula* different ways, as obliquey upward, downward or backward; but, I hink, if this happen'd, it muſt neceſſarily diide this Muſcle into diſtinct Portions, thoſe at contract always ſeparating from thoſe at do not; beſides, the Lengths of the different ibres are unſuitable for any Motion but diectly backward.

Tab. x. 4.

RHOMBOIDES, ariſes Tendinous under ıe former, from the Spinal Proceſſes of the wo inferior *Vertebræ* of the Neck, and Four r Five ſuperior of the *Thorax*, and is inſerted nto the Baſis of the *Scapula*, which it pulls up nd backward. The upper part of this Muſcle riſing from the Neck, is in many Bodies, by he Motions of the Neck, ſeparated and made diſtinct Muſcle.

ELEVATOR SCAPULÆ, ariſes from the tranſverſe Proceſſes of the Four ſuperior *Vertebr* of the Neck, and is inſerted into the upper Angle of the *Scapula.*

SERRATUS MINOR ANTICUS, ariſes under the *Pectoralis*, from the third, fourth and fifth Ribs, and is inſerted into the *Proceſſus Coracoides Scapulæ*, which it pulls forward and downward. This Muſcle is always ſaid to be an *Elevator* of the Ribs, tho' it ariſes from the *Scapula*, which is ſupported by the Ribs.

SERRATUS MAJOR ANTICUS, ariſes from the anterior part of the Eight ſuperior Ribs, and is inſerted into the Baſis of the *Scapula*, which it draws forward, and by that means moves the Socket of the *Scapula* upward. This Muſcle has been always accounted an *Elevor Coſtarum*, tho' each Portion of it is nearly parallel to the Rib it riſes from.

All the Muſcles inſerted into the Baſis of the *Scapula*, are alſo inſerted into one another.

Muſcles of the *Humerus.* Tab. ix. 7.

PECTORALIS, ariſes from near two thirds of the *Clavicula*, next the *Sternum*, and all the length of the *Os Pectoris*, and from the Cartilages of the Ribs, and is inſerted into the *Os Humeri*, between the *Biceps* and the Inſertion of the *Deltoides*. The Uſe of it is to draw the Arm forward. A ſmall Portion of the lower part of this Muſcle is commonly confounded with the *Obliquus deſcendens Abdominis*; and

d in ſome Bodies, neither the upper part, nor
s Tendon, can be eaſily ſeparated from the
eltoides; and in others, even that part of it
at ariſes from the *Clavicula*, is a diſtinct por-
on. At the Inſertion of this Muſcle, the
ibres croſs at acute Angles; thoſe from below
ding above in the Arm, and thoſe from above
elow, otherwiſe the upper Fibres had been too
ort to act with the lower; but this croſſing
's not make the Tendon at all ſtronger, as is
mmonly ſaid; nor can I ſee how it came to
thought that this Tendon ſhou'd want more
rength in proportion, then other Tendons.

DELTOIDES, ariſes exactly oppoſite to the Tab. ix. 6.
nſertion of the *Trapezius*, from one third part
f the *Clavicula*, from the *Acromion* and Spine
f the *Scapula*, and is inſerted Tendinous near
e middle of the *Os Humeri*, which Bone it
fts directly upward. The outermoſt parts
f this Muſcle, when the Arm hangs down,
e below the Center of Motion of the Joynt,
nd therefore can have no ſhare in lifting the
umerus up till it is rais'd part of the way
y the other part of this Muſcle, and the fol-
owing Muſcle; and as the outer parts of this
Muſcle begin to act, the following Muſcle acts
ith leſs advantage; and it ſeems to me, that
he ſole Reaſon why this Muſcle is made of ſo
any parts, is, that they may act Independent-
y; for it is demonſtrable, that this Muſcle,
hen the whole of it acts, cannot raiſe the Arm
with

with as great Moment as a Right-lin'd Muſcle of the ſame Magnitude wou'd have done.

Supraspinatus, ariſes from the *Dorſum Scapulæ* above the Spine, and paſſing between the two Proceſſes, is inſerted into the upper part of the *Os Humeri*, which it helps to raiſe, 'till it becomes parallel with the *Spinæ Scapulæ*.

The *Supraſpinatus*, the *Deltoides* and *Coracobrachialis*, aſſiſt in all the Motions of the *Humerus*, except Depreſſion, it being neceſſary, that the Arm ſhou'd be rais'd and ſuſtain'd, in order to move it to any ſide.

Tab. x 8. Infraspinatus, ariſes from the *Dorſum Scapulæ* below the Spine, and is inſerted (wrapping over part of it) at the ſide of the Head of the *Os Humeri*; it turns the Arm ſupine and backward; for there is a prone and ſupine *rotatory* Motion of the *Humerus* of near 90 Degrees, which may be evidently ſeen when the Elbow is bent.

Teres Minor, is a ſmall Muſcle ariſing below the former from the inferior *Coſtæ Scapulæ*, and is inſerted together with it. This ſhou'd not be conſider'd as a diſtinct Muſcle, but a portion of the laſt deſcrib'd.

Tab. x. 7. Teres Major, ariſes from the lower Angle of the *Scapula*, and is inſerted at the under part of the *Os Humeri* about three Fingers breadth from the Head. This draws the *Os Humeri* toward the lower Angle of the *Scapula*;

and

nd turns the Arm prone and backward.

Tab. x. 6.

LATISSIMUS DORSI, ariſes by a flat Ten-
on from the Spinal Proceſſes of the Seven or
ight inferior *Vertebræ* of the Back, and thoſe
f the Loyns, *Sacrum* and *Ilium*, and growing
eſhy after it has paſs'd the Extenſors of the
runk, receives another ſmall fleſhy beginning
om the Ninth, tenth and eleventh Ribs, and
inſerted into the *Os Humeri*, with the for-
ner. This turns the Arm backward and
rone.

SUBSCAPULARIS, ariſes from the hol-
ow ſide of the *Scapula*, which it fills up, and
inſerted into the Head of the *Os Humeri*,
rapping ſomewhat over it. This pulls the Arm
o the Side, and prone.

CORACOBRACHIALIS, ariſes from the
roceſſus Coracoides Scapulæ, in common with
he Inſertion of the *Serratus minor anticus*, and is
nſerted into the *Os Humeri* internally about its
niddle. This raiſes the Arm, and turns it
omewhat outward.

Muſcles of the Cubit. Tab. ix. 12.

BICEPS CUBITI FLEXOR, ariſes with
wo Heads, (that the Fibres of this Muſcle might
ot compreſs one another) one from the *Proceſ-*
us Coracoides Scapulæ, in common with the *Co-*
acobrachialis Muſcle, and the other by a
ound Tendon from the edge of the *Acetabulum*
capulæ, which paſſing in a *Sulcus* of the *Os*
Humeri, afterward becomes fleſhy, and joyns
he firſt Head to be inſerted with it into the

Tubercle of the *Radius*, and ſometimes thi Muſcle has a third Head, which ariſes from the middle of the *Os Humeri*. This Muſcl lifts up the *Humerus*, bends the Cubit, and ha as great a ſhare as any one Muſcle in turnin the Cubit ſupine; the *Humerus* being fix'd by other Muſcles, the whole Force of this Muſcl will be exerted upon the Cubit, or the Cubi being fix'd by an Extenſor, the whole Force o it will be ſpent in raiſing the Arm, and therefore ought to have been reckon'd by *Borelli* among thoſe that raiſe a weight at Arms length which wou'd make a very wide difference in his Calculations concerning the Force of the Heart. A puncture of the Tendinous expanſion of this Muſcle is ſuppos'd to be always attended with grievous Pain and Inflammation, and has often been Mortal; yet the beſt of Surgeons, and particularly Mr. *Cowper*, has given us Inſtances of larger Tendons being Cut and Stitch'd, without any bad Symptoms; and I have often ſeen them Ulcerated and Mortified, without any more ſign of Pain than in other Parts: So that I cannot ſee what the great Miſchief of pricking this Tendinous *Faſcia* is owing to, unleſs its lying ſo much upon the Stretch, which may be wholly avoided by bending the Elbow, and turning the Cubit prone. Since I have conſider'd this Caſe, I have met with only one, which was thus injur'd by an injudicious Blood-letter, who order'd the Patient to keep her Arm extended for fear of a Contraction, and ſhe was not without the moſt violent Pain for a whole Fortnight; but upon bending the Cubit, and turning the Arm prone, ſhe grew preſently eaſie, and, in a few Days, well.

Tab. ix. 13. BRACHEUS INTERNUS, ariſes from below the middle of the *Os Humeri*, and is inſerted into a rough place of the *Ulna* immediately below the Juncture. This alſo bends the Cubit.

Tab. x. 9. TRICEPS EXTENSOR CUBITI, commonly diſtinguiſh'd into *Biceps* and *Bracheus externus*. The firſt of theſe Heads ariſes from the lower *Coſta* of the *Scapula* near the *Acetabulum*; the ſecond from the outer and back-part of the *Os Humeri*; the third, lower and more internal; and are inſerted into the *Proceſſus Olecranon* of the *Ulna*. The firſt of theſe Heads draws the Arm backward with as long a lever as it extends the Cubit.

Tab. x. 10. ANCONEUS, ariſes from the outward Extuberance of the *Os Humeri*, and is inſerted into the upper part of the *Ulna*: This is alſo an Extenſor; but its proper Uſe is to draw the *Ulna* toward that Extuberance, and thereby to keep the *Radius* up to the *Os Humeri* when the other Extenſors act.

Muſcles of the Palm of the Hand. PALMARIS LONGUS, ariſes ſmall from the inner Extuberance of the *Os Humeri*, and from a ſhort Belly ſoon becomes a Tendon, which is connected to the *Ligamentum Tranſverſale Carpi*, and expanded in the Palm of the Hand. This Muſcle is often wanting, but the Expanſion in the Hand never; but it being connected to the Ligament of the *Carpus*, it muſt bend the *Carpus*, and cannot conſtrict the Palm of the Hand, and when it is wanting the *Flexor Carpi Radialis* is larger.

PALMARIS BREVIS or CARO QUADRATA, ariſes obſcurely from the *Ligamentum Tranſverſale Carpi*, and ſeems to be inſerted into the eighth Bone of the *Carpus* and the Metacarpal Bone of the Little Finger. This helps to conſtrict the Palm of the Hand, and is very different in ſize in different Bodies.

Muſcles of the *Carpus* FLEXOR CARPI RADIALIS, ariſes from the inner Extuberance of the *Os Humeri*, and ſoon forming a large Tendon, is inſerted into the fifth Bone of the *Carpus.*

FLEXOR CARPI ULNARIS, ariſes from the ſame Extuberance with the former, and a *Faſcia* betwixt this Muſcle and the *Tenſor Ulnaris*, contiguous to the *Ulna*, and is inſerted by a ſhort Tendon into the fourth Bone of the *Carpus*.

Tab. x. 12. EXTENSORES CARPI RADIALES; the firſt ariſes from the *Os Humeri* immediately below the *Supinator Radii longus*, and is inſerted into the Metacarpal Bone of the firſt Finger; the ſecond ariſes immediately below this, from the outer Extuberance of the *Os Humeri*, and is inſerted into the Metacarpal Bone of the ſecond Finger. The firſt of theſe Muſcles is a bender of the Cubit as well as an Extenſor of the *Carpus*, and its often acting with the benders of the Cubit while the other is not in Action, is the Reaſon why it is ſo diſtinct from it.

EXTENSOR ULNARIS, ariſes from the ſame Extuberance with the former, and half the *Ulna* below the *Anconeus* Muſcle; then becoming a Tendon, runs in a ſmall Sinus at the bottom of the *Ulna*, and is inſerted into the Metacarpal Bone of the Little Finger. See *Ulna.* Pag. 30, 31.

The *Flexor* and *Tenſor Ulnaris* acting together turn the Hand downward, the *Tenſor* and *Flexor Radialis* upward.

Muſcles of the Fingers.

PERFORATUS or FLEXOR SECUNDI INTERNODII DIGITORUM, ariſes from the inner Tubercle of the *Os Humeri*, and from the upper part of the *Ulna*, and the middle of the *Radius*; then becoming Four ſtrong Tendons, paſſes under the *Ligamentum tranſverſale Carpi*, and is inſerted into the beginning of the ſecond Bone of each Finger.

PERFORANS or FLEXOR TERTII INTERNODII DIGITORUM, ariſes from half the *Ulna*, and a great part of the Ligament between the *Ulna* and *Radius*, then becoming Four Tendons, paſſes under the *Ligamentum tranſver-*

ſale Carpi, and thro' the Tendons of the former Muſcle to their Inſertion into the third Bone of each Finger. The Tendons of both theſe Muſcles are ty'd down to the Fingers by a ſtrong Ligament.

LUMBRICALES or FLEXORES PRIMI INTERNODII DIGITORUM, ariſe from the Tendons of the laſt mention'd Muſcle, and are inſerted laterally toward the Thumb into the beginning of the firſt Bone of each Finger.

Tab. x. 13. EXTENSOR DIGITORUM COMMUNIS, ariſes from the outer extuberance of the *Os Humeri*, and paſſing under a Ligament, at the Wriſt, is divided into four Tendons which communicate upon the firſt Joynt, which keeps them from ſliding off the Joynts of the Fingers, where they are a little connected to the firſt Bones, and afterward are inſerted into the beginning of the ſecond Bone of each Finger.

EXTENSOR AURICULARIS or MINIMI DIGITI, is a portion of the laſt Muſcle paſſing under the Ligament in a diſtinct Channel.

EXTENSOR INDICIS, ariſes from the middle of the *Ulna*, and paſſing under the Ligament of the *Carpus*, is inſerted with the *Extenſor Communis* into the Fore-finger. This Muſcle extends the Fore-finger ſingly. I have twice ſeen it wanting.

INTEROSSEI, are ſix bicipital Muſcles in the Interſtices of the Metacarpal Bones, ariſing from their ſides, and running obliquely to the Top of each Finger, are inſerted into the laſt Bone of each Finger. Theſe either extend or divide the Fingers, with the aſſiſtance of the Two following Muſcles.

ABDUCTOR INDICIS, ariſes from the lower part of the firſt Bone of the Thumb and the Metacarpal Bone of the firſt Finger, and is inſerted into the laſt Bone of the Finger, like the *Interoſſei.* That part of this Muſcle that ariſes from the Thumb is alſo a true *Adductor* of the Thumb, and, I think, the only Muſcle in the Body that in any Caſe acts at an obtuſe Angle.

ABDUCTOR MINIMI DIGITI, is always Two diſtinct Muſcles; the firſt of which draws the Little Finger from the reſt, and extends it; it ariſes from the tranſverſe Ligament and fourth Bone of the *Carpus*, and is inſerted like the *Interoſſei*; the other ariſes from the eighth Bone and tranſverſe Ligament of the *Carpus*, and is inſerted into the Metacarpal Bone of the Little Finger, which it pulls toward the Thumb to conſtrict the Palm of the Hand.

Muſcles of the Thumb.

EXTENSOR PRIMI INTERNODII POLLICIS, ariſes from the *Ulna* below the *Anconeus* Muſcle, and the Ligament between the *Ulna* and *Radius*, then becoming Two, Three, or Four Tendons, is inſerted into the fifth Bone of the *Carpus*, and firſt of the Thumb. The firſt of theſe Inſertions can only aſſiſt the bending of the Wriſt upward, and in turning the Arm ſupine.

EXTENSOR SECUNDI INTERNODII POLLICIS, ariſes immediately below the former, from the *Radius* and tranſverſe Ligament, and is inſerted by a few Fibres into the ſecond Bone of the Thumb, but chiefly into the Third.

EXTENSOR TERTII INTERNODII POLLICIS, ariſes immediately below the laſt deſcrib'd, from the *Ulna* and Ligament, and paſſes over the *Radius* nearer the *Ulna* to be inſerted at the third Bone of the Thumb: This extends the Thumb more toward the *Ulna* than the former Muſcle.

FLEXOR PRIMI ET SECUNDI OSSIS POLLICIS, ariſes from the fifth Bone and tranſverſe Ligament of the *Carpus*, and from the beginnings of the two firſt Metacarpal Bones, and is inſerted into the whole length of the firſt Bone of the Thumb, and Tendinous into the beginning of the ſecond; the Seſamoid Bones of the Thumb, in ſuch Bodies as have them, lie in this Tendon, where it paſſes over the Joynt. This Muſcle may, in ſome Bodies, be divided into Three.

FLEXOR TERTII INTERNODII POLLICIS, ariſes large from almoſt all the upper part of the *Radius*, and becoming a round Tendon paſſes under the *Ligamentum tranſverſale Carpi* to be inſerted into the third Bone of the Thumb: This Muſcle ſingly acting, draws the Thumb toward the Metacarpal Bone of the Little Finger; but the laſt mention'd Muſcle acting with it, turns it toward the Fore-finger.

ADDUCTOR POLLICIS, ariſes from the *Carpus*, and almoſt the whole length of the Metacarpal Bone of the Long-Finger, and is inſerted into the beginning of the ſecond Bone of the Thumb. This Muſcle naturally enough divides into Two, and might better be call'd a *Flexor* than *Adductor*.

ABDUCTOR POLLICIS, ariſes from the fifth Bone and *Ligamentum tranſverſale* of the *Carpus*, and is inſerted laterally into the beginning of the ſecond Bone of the Thumb to draw it toward the *Radius*.

Muſcles of the *Radius*.

SUPINATOR RADII LONGUS, ariſes from the lower and outer part of the *Os Humeri*, and is inſerted into the upper ſide of the *Radius* near the *Carpus*: This Muſcle bends the Cubit at a longer lever then either of the Muſcles that are appropriated by Anatomiſts for that uſe, and is not more a Supinator than the Extenſors of the *Carpus* that lie under it, nor ſo much a Supinator as any of the Extenſors of the Thumb.

SUPINATOR RADII BREVIS, ariſes from the outer Extuberance of the *Os Humeri* and upper part of the *Ulna*, and running half round the *Radius*, is inſerted near its Tubercle.

PRONATOR TERES, ariſes from the inner *Apophyſis* of the *Os Humeri*, and upper and forepart of the *Ulna*, and is inſerted Tendinous into the *Radius* below the former.

PRONATOR QUADRATUS, ariſes from the lower Edge of the *Ulna* near the *Carpus*, and paſſing under the Flexors of the Fingers, is inſerted into the upper part of the *Radius*.

Theſe Muſcles are occaſionally aſſiſted in their Actions by Muſcles of the Hand; moſt of the Extenſors aſſiſting the Supinators, and moſt of the Flexors the Pronators, and moſt of the Extenſors of the Hand take a great part of their Origin from the Tendinous *Faſcia* that covers them.

Muſcles of the Head and Neck. Tab. ix. 2.

MASTOIDEUS, ariſes Tendinous from the *Sternum* near the *Clavicula*, and by a ſeparate fleſhy portion from the *Clavicula* which ſoon unites with the other beginning, and is inſerted to the outer part of the Mamillary Proceſs of the Temporal Bone. This with its Fellow, pull the Head and Neck toward the Breaſt, and act with a much longer lever upon each lower *Vertebra*, than they do upon the next above. This Muſcle being inſerted into the Head, beyond the Center of Motion of the Head with the firſt *Vertebra*, has been ſuppos'd by Mr. *Cowper*, and others, to pull the Head backward; but paſſing beyond ſignifies nothing to that purpoſe, unleſs a Line paſſing thro' its Axis wou'd paſs below the Center of Motion: And it is the more to be wonder'd how this Miſtake prevail'd, if we conſider that this Muſcles being added to the Extenſors of the Head and Neck, wou'd make the Force of that Action more than a hundred times greater than that of the Benders. And if this is not enough to convince, let any one lying on his Back raiſe his Head, and he will ſoon feel this Muſcle in action; but bowing the Head forward in an erect Poſture will not ſhow this, unleſs ſome reſiſtance is made to the Head, becauſe the Center of Gravity of the Head lying before the Center of Motion, there needs no more than a relaxation of the Extenſors to bring the Head forward, in that Poſture.

RECTUS INTERNUS MAJOR, ariſes from the anterior part of the Tranſverſe Proceſſes of the third, fourth, fifth and ſixth Cervical *Vertebræ*, and paſſing over the Two ſuperior, is inſerted into a Roughneſs of the Occipital Bone near the fore-part of the great *Foramen.* This bends the Head on the Two firſt *Vertebræ* of the Neck.

RECTUS MINOR INTERNUS, ariſes under the laſt Muſcle, from the firſt *Vertebra*, and is inſerted under it into the *Os Occipitis.* This bends the Head on the firſt *Vertebra.*

RECTUS LATERALIS, ariſes from the anterior part of the tranſverſe Proceſs of the firſt *Vertebra* of the Neck, and is inſerted into the *Os Temporis* and *Occipitis* between the Mamillary and Styloid Proceſſes. This turns the Head to one ſide.

SPLENIUS, ariſes by a thin Tendon from the Spinal Proceſſes of the Five ſuperior *Vertebræ* of the *Thorax*, and Two inferior of the Neck, and *Linea alba Colli*, and is inſerted into the *Os Occipitis*, the upper part of the Mamillary Proceſs of the Temporal Bone, and the Tranſverſe Proceſſes of the Three ſuperior Cervical *Vertebræ*. This pulls the Head and Neck backward, and to the contrary ſide; but both of theſe acting together pull them directly backward.

COMPLEXUS, ariſes from the Tranſverſe Proceſſes of the Six or ſeven ſuperior *Vertebræ* of the *Thorax*, and Six inferior of the Neck, and is inſerted into the *Os Occipitis*, and back-part of the *Os Temporis*; which laſt part in ſome Bodies is ſeparate. This pulls the Head back.

RECTUS MAJOR POSTICUS, ariſes from the Spinal Proceſſes of the ſecond *Vertebra* of the Neck, and is inſerted broader into the *Os Occipitis*. It pulls the Head back on the Two firſt *Vertebræ*.

RECTUS MINOR POSTICUS, ariſes from the back-part of the firſt *Vertebra* of the Neck, it having no Spinal Proceſs) and is inſerted elow the former into the ſame Bone to pull he Head back on the firſt *Vertebra*.

OBLIQUUS SUPERIOR, ariſes from the ranſverſe Proceſs of the firſt *Vertebra*, and is nſerted into the *Os Occipitis* near the *Rectus* *ajor*; either of theſe acting, aſſiſt the *Rectus* *teralis* on the ſame ſide; but both together, ull the Head back.

OBLIQUUS INFERIOR, ariſes from the pinal Proceſs of the ſecond *Vertebra* of the eck, and is inſerted into the Tranſverſe Pro- eſs of the firſt. This, with its Fellow, al- ernately acting, turn the Head with the rſt *Vertebra* in a rotatory manner on the ſe- ond, whoſe *Proceſſus Dentatus* is the *Axis* of his Motion.

INTERSPINALES COLLI, are Three r Four pair of Muſcles between the Bifid Pro- eſſes of the Cervical *Vertebræ*, which they raw nearer each other when the Neck is bent ackward.

LONGUS COLLI, ariſes laterally from e Bodies of the Four ſuperior *Vertebræ* of the *horax*, and from the anterior part of the ranſverſe Proceſſes of the Five inferior *Verte- ræ* of the Neck, and is inſerted into the fore- art of the firſt and ſecond *Vertebra* of the eck, which it bends forward.

INTERTRANSVERSALES COLLI, are ortions of Fleſh between the tranſverſe Proceſſes of the *Vertebræ* of the Neck, like the *Interſpinales*, but not ſo diſtinct; they draw thoſe Proceſſes together.

SPINALIS COLLI, ariſes from the tranſverſe Proceſſes of the Five ſuperior *Vertebræ* of the Back, and is inſerted into the ſpinal Proceſſes of the ſecond, third, fourth and fifth *Vertebræ* of the Neck. This pulls the Neck backward.

TRANSVERSALIS COLLI, ariſes from the oblique Proceſſes of the four inferior *Vertebræ* of the Neck, and is inſerted into the Spinal Proceſs of the ſecond *Vertebra* of the Neck. This Muſcle is but a continuation of the *Tranſverſalis* or *Semiſpinalis Dorſi.*

The Muſcles of the Head and Neck are moſt of them obliquely directed, which makes them perform the oblique Motions, as well as Extenſion and Flexion, which is highly convenient in this Caſe, becauſe the Joynts mov'd by theſe Muſcles, being under the weight mov'd, it is neceſſary that the Head ſhou'd be kept ſteady by the Extenſors, and Flexors too, when any great weight is upon the Head; and theſe Muſcles from the obliquity of their Directions not only perform theſe two Actions at once but acting by pairs they move the Head and Neck ſteadily, in a diagonal Direction, which ſtreight Muſcles cou'd not have done.

Muſcles of the *Thora*

SCALENUS, ariſes from the tranſverſe Proceſſes of the ſecond, third, fourth and fifth

Cervical

ervical *Vertebræ*; it is inſerted in three parts, eing thus divided for the tranſmiſſion of the *ubclavian* Veſſels) into the two uppermoſt Ribs. his Muſcle may bend the Neck, but its chief ſe is to ſupport the upper Ribs, which is ne- eſſary to determine the contraction of the Inter- oſtal Muſcles that way, and a Ligament cou'd ot have done this, becauſe of the various oſitions that the Neck and Back are liable).

SERRATUS SUPERIOR POSTICUS, ari- es with a thin Tendon inſeparable from the *homboides*, from the Spinal Proceſſes of the wo inferior Cervical *Vertebræ*, and two ſu- erior of the *Thorax*, and is inſerted into the econd, third, and fourth Ribs, immediately eyond their Bendings; this, with the *Scalenus*, ſtains the upper Ribs, that they might not e pull'd downward, as the lower Ribs are up- ard in Inſpiration, by the Depreſſors of the ibs in Exſpiration.

SERRATUS INFERIOR POSTICUS, ari- es with a broad Tendon (inſeparable from that f the *Latiſſimus Dorſi*) from the Spinal Pro- eſſes of the Three ſuperior *Vertebræ* of the oyns, and Two inferior of the *Thorax*, and is nſerted into the Four loweſt Ribs, chiefly the inth and eleventh. It pulls down the Ribs in xſpiration. The lower part of this Muſcle is ften inſeparable from the *Obliquus aſcendens bdominis*.

INTERCOSTALES, are Eleven Pair on each ſide, in the Interſtices of the Ribs; from their Order of Fibres diſtinguiſh'd into External and Internal; they all ariſe from the under Edge of each Rib, and are inſerted into the upper Edge of the Rib below. The External are largeſt backward, having their firſt beginnings from the tranſverſe Proceſſes of the *Vertebræ* like diſtinct Muſcles, which ſome call *Levatores Coſtarum.* The Internal run all from above obliquely backward; being thickeſt forward, and thinneſt toward the Spine. Theſe are alſo continu'd betwixt the Cartilages of the Ribs, with Fibres perpendicular to the Cartilages; and between the Cartilages of the loweſt Ribs, they are inſeparable from the *Obliquus aſcendens Abdominis.* Theſe Muſcles by drawing the Ribs nearer to each other, pull 'em all upward, (they being ſuſtain'd at the top by the *Scalenus* and *Serratus ſuperior poſticus*) and dilate the *Thorax.* To theſe Mr. *Cowper* adds ſome fleſhy Fibres, which run from one Rib over a ſecond to a third, near the Spine, which he calls *Depreſſores Coſtarum*; but theſe Fibres muſt as certainly be *Levatores Coſtarum*, as the *Intercoſtales*, unleſs they ariſe below, from the tranſverſe Proceſſes of the *Vertebræ* of the Back.

TRIANGULARIS STERNI, ariſes internally from the Edge of the *Os Pectoris*, and is inſerted into the Edge of the ſecond,

hird, fourth, fifth and ſixth Ribs. This pulls
he Ribs to the Bone of the *Sternum*, and there-
y bends its Cartilages in Exſpiration.

DIAPHRAGMA, ariſes on the Right ſide Tab.x. A,B.
y a Proceſs from Three Lumbal *Vertebræ*,
nd One of the *Thorax*; and on the Left,
rom the one Superior of the Loyns, and Inferior
f the *Thorax*; (this laſt part being leſs to
ive way to the great Artery) and is inſerted
nto the lower part of the *Sternum* and the Five
nferior Ribs. The middle of this Muſcle is
flat Tendon, from whence the fleſhy Fibres
egin, and are diſtributed, like *Radii*, from a
enter to a Circumference. When this Muſcle
cts alone, it conſtricts the *Thorax*, and pulls
he Ribs downward, and approaches toward a
lain; which Action is generally perform'd to
romote the Ejection of the *Fœces*. In large
nſpirations, when the Intercoſtals lift up the
ibs to widen the *Thorax*, this Muſcle acts
nough to bring it ſelf toward a plain with-
ut overcoming the force of the Intercoſtals;
y which means the Breaſt is at once widen'd
nd lengthen'd: When it acts with the *Abdomi-*
al Muſcles it draws the Ribs nearer together,
nd conſtricts the *Thorax*, and the ſuperior force
f the *Abdominal* Muſcles thruſting the parts
f the lower Belly againſt it, it becomes at the
me time Convex upward, and ſhortens the
horax, which occaſions the largeſt Exſpirations;
r acting alternately with the *Abdominal*

Muſcles only, a more moderate Inſpiration and Exſpiration is made by ſhortening and lengthening the *Thorax* only, which is what we chiefly do when lying down; or acting alternately with the Intercoſtals only, a moderate Exſpiration and Inſpiration, is caus'd by the widening and narrowing the Breaſt, which is what we are moſt prone to in an erect Poſition, the Muſcles of the *Abdomen*, at ſuch times, being employ'd in ſupporting the Parts contain'd in the *Abdomen*. And tho' theſe Motions of the Ribs require at any one time but very little Force, the *Aer* within the *Thorax* ballancing that without; yet that theſe Muſcles whoſe Motions are eſſential to Life may be never weary, the Inſpirators in moſt Men, have Force ſufficient to raiſe *Mercury* in a Tube four or five and twenty Inches, in an erect Poſture, and the Exſpirators ſix or ſeven; the firſt of which will require about Four thouſand pound Force, in moſt Men, and the other proportional. But, I imagine, that lying down, theſe Proportions will differ by the weight of the Parts contain'd in the *Abdomen*. In all the Bodies I have Diſſected, I have found the Diaphragm Convex upward, which gave me occaſion to think, that all Animals died in Exſpiration, 'till the forementioned Experiment diſcover'd, that the Muſcles of Inſpiration were ſtronger than thoſe of Exſpiration; which led me to make the following Experiment. I cut the Wind-pipe of a Dog, and having a String ready fix'd, I put a Cork into it, and tyed it faſt inſtantly after Inſpiration; upon which I obſerv'd, that the Diaphragm, and the other Muſcles of Inſpiration and Exſpiration, were alternately contracted, and diſtended for ſome time; but when he was dead, the Abdominal Muſcles were in a ſtate of Contraction, the Ribs were elevated to dilate the *Thorax*, and the Diaphragm was Convex upward; which alſo ſhews, that the Diaphragm is not a Muſcle of equal Force either to the Depreſſors or Elevators of the Ribs, it neither hindering the Elevators from raiſing the Breaſt; nor the Depreſſors from thruſting it upward, by compreſſing the parts contain'd in the *Abdomen*, tho' the Breaſt was full of *Aer*.

Muſcles of the Loins, Back and Neck.

SACER, SACROLUMBALIS, LONGISSIMUS DORSI, and SEMISPINALIS, are all that portion of Fleſh betwixt the *Os Sacrum* and the Neck, which, ſeeing there is no Membrane to diſtinguiſh it into ſeveral Muſcles, and that it is all imploy'd in the ſame Actions, I ſhall give it the Name of *Extenſor Dorſi & Lumborum*, and deſcribe it all as One Muſcle.

EXTENSOR DORSI ET LUMBORUM, ariſes from the upper part of the *Os Sacrum*, the Spine of the *Os Ilium*, and the back-parts of the owermoſt *Vertebræ* of the Loins; that part of his Muſcle which is known by the Name of *Sacrolumbalis* is inſerted into all the Ribs near their

Articulations, with the Tranſverſe Proceſſes of the *Vertebræ*, and into the Tranſverſe Proceſs of the laſt *Vertebra* of the Neck; beſides, as this paſſes over the Ribs, it receives an Origin from every Rib, in a manner that cannot well be deſcrib'd: The next portion of this Muſcle, call'd *Longiſſimus Dorſi*, is inſerted into all the Tranſverſe Proceſſes of the *Vertebræ* of the Back, and partly into the Ribs, and the uppermoſt tranſverſe Proceſſes of the *Vertebra* of the Loins; and the upper end of it is neither very diſtinct from the *Complexus* of the Head, nor *Spinalis* of the Neck. The reſt of this Muſcle, known by the Names of *Semiſpinalis*, *Sacer*, &c. ariſes alſo from all the tranſverſe and oblique Proceſſes of the Loins and Back; every portion, except the lowermoſt, paſſing over five Joynts, is inſerted into the Spinal Proceſs of the ſixth *Vertebra* above its Origin all the way up the Back, and at the Neck commences *Tranſverſalis Colli:* This paſſing of each Portion of a Muſcle over a few Joynts diſtributes their Force equally enough among all theſe Joynts, without the Fibres being directed more obliquely than thoſe of *Penniform* Muſcles; but the Neck and Loins not having ſufficient Proviſion of this ſort, there are ſmall Muſcles between their Proceſſes, which tho they are of ſmall Importance for the Motions of thoſe parts, are ſufficient to diſtribute the Force of larger Muſcles equally among thoſe Joynts;

oynts; and beſides the uſes of the *Extenſor*
orſi & *Lumborum*, which its Name implies,
t, and its Fellow, alternately raiſe the Hips
n Walking, which any one may feel by laying
Hand upon the Back.

Muſcles of the Loins.

QUADRATUS LUMBORUM, ariſes
rom the upper part of the Spine of the *Ilium*,
nd is inſerted into all the Tranſverſe Lumbal
roceſſes. This, with its Fellow, acting alter-
ately, aſſiſt the laſt mention'd Muſcle in rai-
ng the *Oſſa Innominata* in Progreſſion. Each
cting ſingly, while the lower Limbs are not
nov'd, inclines the Body to one ſide; or both,
raw the Body forward.

INTERTRANSVERSALES LUMBO-
UM, are ſmall Muſcles ſeated between all
he Tranſverſe Proceſſes of the *Vertebræ Lum-*
orum, to bring them nearer together.

PSOA PARVA, ariſes laterally from the
ody of the firſt Lumbal *Vertebra*, and ſoon
ecoming a ſmall Tendon, is inſerted into the
s *Innominatum* at the joyning of the *Ilium*
nd *Pubis*. It either aſſiſts in bending the
oyns forward, or raiſing the *Os Innominatum*
progreſſive Motions. This Muſcle is often
anting.

Muſcles of the Thigh;

PSOA MAGNA, ariſes laterally from the
odies of the Four ſuperior *Vertebræ* of the
oyns, and is inſerted with the following
Muſcle into the *Os Femoris*, near the leſſer

Trochanter. This bends the Thigh, and when the *Pſoa Parva* is wanting this is larger.

ILIACUS INTERNUS, ariſes from the concave part of the *Ilium*, and from its lower Edge, and paſſing over the *Ilium* near the *Os Pubis*, joins the former Muſcle, and is inſerted with it, to be imploy'd in the ſame Action.

PECTINEUS, ariſes from the *Os Pubis* or *Pectinis*, near the joyning of that Bone with its Fellow, and is inſerted into the *Linea Aſpera* of the Thigh-bone, for about Four Fingers breadth below the leſſer *Trochanter.* This bends the Thigh and turns the Toes outward.

TRICEPS FEMORIS, the two leſſer Heads of this Muſcle ariſe under the *Pectineus*, and the third from the inferior Edges and back-part of the *Os Pubis* and *Iſchium*, and it is inſerted into the whole length of the *Linea Aſpera* and the inner *Apophyſis* of the *Os Femoris*. This alſo bends the Thigh and turns the Toes outward. When the Thigh-bone is mov'd in a plain, which cuts at Right-Angles a plain that paſſes thro' the Axis of either Head of the laſt Muſcle, that Head riſing lower than the Center of Motion of the Hip-Joynt, it will equally aſſiſt both the Flexors and Extenſors, and that moſt when the Bone has been mov'd moſt backward or forward; and as either of theſe Heads lie more or leſs out of the ſaid plain, they will give greater aſſiſtance to that Motion which is made nade on the ſide of the ſaid plain, contrary to heir ſituation, and leſs on the ſame ſide. This Mechaniſm is frequently made uſe of to make ne Muſcle ſerve different Actions; but I have nly explain'd it in this inſtance, becauſe it is he moſt conſiderable one that I know.

GLUTEUS MAXIMUS, ariſes from the ack-part of the Spine of the *Ilium*, and the *Dorſum Ilii*, and ſide of the *Os Coccygis* and *acrum*, and a Ligament extended between theſe ones, and from a thin *Faſcia* ſpread over that art of the following Muſcle, which this does ot cover, and is inſerted by a ſtrong Tendon nto the upper part of the *Linea Aſpera* of the Thigh-Bone, and alſo into the flat Tendon of e *Faſcialis* Muſcle; which latter Inſertion, ho' very conſiderable, is not often obſerv'd. This extends the Thigh, and both theſe together being contracted, occaſionally aſſiſt the *evatores Ani* in ſupporting the *Anus*. The readth of the Origin and Inſertion (partly nto a Tendon) of this Muſcle, is very obſervable, for by that means, tho' it is the largeſt Muſcle in the Body, it is nevertheleſs Right-n'd, without one Fibre compreſſing another ny more than in *Penniforme* Muſcles.

GLUTEUS MEDIUS, ariſes from all the nterior part of the *Spina* and *Dorſum Ilii*, and nder part of the laſt mention'd Muſcle, and inſerted into the upper part of the great *Tro-*

Trochanter of the Thigh-bone. This extends the Thigh outward.

GLUTEUS MINIMUS, ariſes intirely under the former, from the *Dorſum Ilii*, and is inſerted into the upper and anterior part of the great *Trochanter*, to extend the Thigh.

PYRIFORMIS, ariſes internally from the inſide of the *Os Sacrum*, and growing in more than half its progreſs into a round Tendon, is inſerted into the upper part of the great *Trochanter*. This aſſiſts ſomewhat in extending the Thigh, but more in turning it outward.

QUADRATUS FEMORIS, ariſes from the obtuſe Proceſs of the *Iſchium*, and is inſerted into the upper part of the *Linea Aſpera* of the Thigh-bone, between the two *Trochanters*. This draws the Thigh inward, and directs the Toes outward.

OBTURATOR INTERNUS, or MARSUPIALIS, ariſes generally from a ſtrong Membrane or Ligament, which fills up the Hole of the *Os Innominatum*, and from the Circumambient Bone; thence paſſing over a Channel in the *Iſchium* betwixt its two Proceſſes, it receives from them two other portions, which are a ſort of *Marſupium*; and is inſerted into the *Sinus* of the great *Trochanter*. This turns the Thigh outward.

OBTURATOR EXTERNUS, ariſes oppoſite to the former, from the outſide of the *Os Innominatum*, and is inſerted into the *Sinus* of the he great *Trochanter.* This alſo turns the Thigh outward. Theſe Four laſt mention'd Muſcles acting with the Extenſors, prevent their turning the Toes inward, or acting alone they turn them outward, and draw the Thigh nward; and as theſe direct, the ſame Extenſors will turn the Thigh either outward or backward, with their full force.

Muſcles of the *Tibia.*

FASCIALIS or MEMBRANOSUS, ariſes from the fore-part of the Spine of the *Ilium*, and in about Five Inches progreſs becomes a flat Tendon or *Faſcia*, which is joyn'd by a conſiderable detachment from the Tendon of the *Gluteus maximus*, and then covering in an eſpecial manner the *Vaſtus externus* Muſcle, is inſerted at the top of the *Fibula*, and then proceeds to join the *Faſcia*, which covers the upper part of the Muſcles ſituate on the outſide of the *Tibia*, which about the middle of the Leg grows looſe, and is ſo continu'd to the top of the Foot, being connected there and at the lower part of the Leg, to the Ligaments which tye down the Tendons; this Tendon, where it covers the *Vaſtus externus*, receives additional tranſverſe Fibres, which run round the Thigh, but are moſt conſpicuous on the outſide. This draws the Thigh outward, and paſſing over the Knee forwarder than its Center of Motion, it will help to extend that Joynt.

GRACILIS, ariſes from the *Os Pubis* cloſe to the *Penis*, and is inſerted into the *Tibia* Four or Five Fingers breadth below the Knee. This draws the Leg toward its Origin, and paſſing over the Knee behind its Center of Motion, it will help to bend it.

SARTORIUS, ariſes from the fore-part of the Spine of the *Ilium*, and thence deſcending obliquely to the inſide of the *Tibia*, is there inſerted Four or Five Fingers breadth below the Joynt. This at once helps to bend both the Thigh and Leg, (particularly the Thigh) at very long Levers; it directly helps to lift up the Leg in walking up Stairs, or laying the Legs a-croſs like Taylors.

SEMITENDINOSUS, ariſes from the obtuſe Proceſs of the *Iſchium*, and growing a round Tendon in ſomewhat more than half its progreſs, is inſerted near the former Muſcles into the *Tibia*; it helps to extend the Thigh and bend the *Tibia*.

SEMIMEMBRANOSUS, ariſes by a flat Tendon like a Membrane from the obtuſe Proceſs of the *Iſchium*, and being continu'd tendinous betwixt the Bellies of the laſt mention'd and following Muſcles, and then growing fleſhy, becomes again tendinous above the Joynt, and is inſerted nearer the Joynt than the former Muſcle for the ſame Uſe.

Theſe Two make the Internal Hamſtring, and ariſing and inſerting ſo near together, they might have been one Muſcle, but their Fibres wou'd have been twice as long, which

wou'd

ou'd have given a Motion twice as quick, and
ut half ſo ſtrong, unleſs it had been inſerted at a
iſtance from the Joynts it wou'd be liable to move
roportionable to its length, which cou'd not
ell be, therefore NATURE has made them
wo Muſcles of a Number of Fibres nearly equal
o what one cou'd have been, and about half the
ength, and inſerted them accordingly, at di-
ances from the Center of Motion of the Knee,
roportional to the different lengths of their
ibres in the directions of their Axes.

BICEPS TIBIÆ, the firſt Head ariſes in
ommon, with the Two preceding Muſcles, from
he obtuſe Proceſs of the *Iſchium*; the ſecond
rom the lower part of the *Linea Aſpera* of
he Thigh-bone; this ſoon joyns the former,
nd is inſerted with it into the upper part of
he *Fibula* to bend the Leg, and the firſt Head
lſo extends the Thigh. The Tendon of this
uſcle makes the External Hamſtring.

POPLITEUS, ariſes from the outer *Apo-*
hyſis of the *Os Femoris*, and thence running
bliquely inward, is inſerted into the *Tibia* im-
ediately below its Head. This aſſiſts the Flex-
rs, and draws the *Tibia* toward the outer *Apo-*
hyſis of the Thigh-bone, whereby they make
n obtuſe Angle, and the Leg becomes per-
endicular to the Center of Gravity in pro-
reſſion.

RECTUS TIBIÆ, ariſes with a Tendon
rom the upper part of the *Acetabulum* of the

Os Innominatum, and by another Tendon (which is a ſort of Ligament to this) from a *Proceſſus Innominatus* of the *Ilium* below its Spine forward, and is inſerted together with the Three following Muſcles into the *Patella.* It bends the Thigh, and extends the *Tibia.*

VASTUS EXTERNUS, ariſes from the anterior part of the great *Trochanter* and outſide of the *Linea Aſpera* of the Thigh-bone, and is inſerted into the upper and external part of the *Patella.* It extends the *Tibia.*

VASTUS INTERNUS, ariſes from the inner and lower part of the *Linea Aſpera*, and is inſerted into the upper and inner part of the *Patella*, to extend the *Tibia*; and the Fibres of this Muſcle being oblique, it keeps the *Patella* in its place, the other Muſcles lying in the direction of the *Os Femoris*, which makes an obtuſe Angle with the *Tibia*; they wou'd alone be liable to draw the *Patella* outward. This Contrivance is moſt obvious in thoſe whoſe Knees bend moſt inward.

CRUREUS, ariſes between the Two laſt and under the *Rectus*, from all the convex part of the *Os Femoris*, and is inſerted in like manner into the *Patella*; the *Patella* being ty'd down by a ſtrong Ligament to the *Tibia.* Theſe three laſt Muſcles extend the *Tibia* only, and might very properly be call'd, *Extenſor Tibiæ Triceps.*

When the *Patella* is ſo broke tranſverſe that he part into which the Muſcles are inſerted is iſtinctly ſeparated from that by which the Ligament is fix'd, the Fracture can never be ur'd, becauſe the Muſcles will keep the parts ſunder; but when the Fracture is otherwiſe it dmits of Cure.

Muſcles of the *Tarſus.*

GASTEROCNEMIUS, ariſes by Two ſmall Beginnings from the back-part of the *Apophyſes* f the *Os Femoris*, which ſoon becoming large ellies unite, and then become a flat Tendon which joyns the following Muſcles to be inſerted nto the *Os Calcis*. The two parts of this Muſcle, are by ſome Writers diſtinguiſh'd into Two Muſcles. Its uſe is to extend the *Tarſus* and end the Knee.

PLANTARIS, ariſes under the outer Beginning of the laſt nam'd Muſcle, from the xternal *Apophyſis* of the *Os Femoris*, and ſoon ecoming a ſmall Tendon, is ſo continu'd betwixt the foregoing and ſubſequent Muſcles, and is inſerted with them. It bends the Knee and xtends the *Tarſus*. Authors derive the Tendiious expanſion on the bottom of the Foot from he Tendon of this Muſcle; But ſeeing the Expanſion is much more than this Tendon cou'd make, and that this Tendon can be trac'd o farther than the *Os Calcis*, and that the Expanſion is as large when the Muſcle is wanting, which is not ſeldom, I cannot be of that Opinion.

GASTEROCNEMIUS INTERNUS, ariſes from the upper part of the *Tibia*, and one third of the *Fibula* below the *Popliteus*, and is inſerted with the Two foregoing Muſcles by a ſtrong Tendon into the upper and back-part of the *Os Calcis*. This Muſcle only extends the *Tarſus*.

TIBIALIS ANTICUS, ariſes from the upper and exterior part of the *Tibia*, and is inſerted laterally into the *Os Cuneiforme majus* of the *Tarſus*. This bends and turns the *Tarſus* inward.

TIBIALIS POSTICUS, ariſes under the Flexors of the Toes from the upper and middle part of the *Tibia*, and from the middle of the *Fibula*, and the Ligament betwixt the *Tibia* and *Fibula*; then growing a round Tendon, paſſes under the inner Ancle, and is inſerted into the lower part of the *Os Naviculare*. This extends and turns inward the *Tarſus*.

PERONEUS LONGUS, ariſes from the upper and outer part of the *Fibula*, and growing a Tendon toward the lower part of this Bone, paſſes under the outer Ancle, and the Muſcles ſituated on the bottom of the Foot, and is inſerted into the beginning of the Metatarſal Bone of the great Toe, and the *Os Cuneiforme* next that Bone. This turns the *Tarſus* outward, and directs the force of the other Extenſors of the *Tarſus* toward the Ball of the great Toe.

PERONEUS BREVIS, ariſes from the midlle of the *Fibula*, under a part of the former, nd growing Tendinous, paſſes under the outer Ancle, and is inſerted into the beginning of the pper part of the *Os Metatarſi* of the Little Toe, nd ſometimes beſtows a ſmall Tendon on the ittle Toe. Its uſe is to extend the *Tarſus*, and urn it outward.

Theſe two laſt Muſcles riding over the lower nd of the *Fibula*, are often the cauſe of a Sprain n the outer Ancle, when they are vehemently xerted, to ſave a Fall, and ſometimes they ave even broke the lower end of the *Fibula*, nd Sprain'd the Ancle at once.

Muſcles of the Great Toe.

EXTENSOR POLLICIS LONGUS, ariſes rom the upper and middle part of the *Fibula* nd *Ligamentum Tranſverſale*, and ſoon becomng a ſtrong Tendon, is inſerted into the laſt one of the great Toe. This alſo bends the *arſus* with a much longer Lever than it extends he Toe.

EXTENSOR POLLICIS BREVIS, ariſes rom the upper part of the *Os Calcis*, and is inerted into the ſame place with the former.

FLEXOR POLLICIS LONGUS, ariſes rom the *Fibula*, oppoſite to the *Extenſor longus*, nd then paſſing under the inner Ancle, is inerted to the under ſide of the laſt Bone of the reat Toe. This extends the *Tarſus* at a longer ever than it bends the Toe.

FLEXOR BREVIS, and ADDUCTOR POLLICIS, are the ſame Muſcle, ariſing from the two leſſer *Oſſa Cuneiformia* and *Os Cuboides*, and *Calcis*; they are inſerted into the *Oſſa Seſamoidea*, and ty'd to the firſt Bone of the great Toe, reckoning only two Bones to the great Toe. Theſe Muſcles bend the great Toe.

ABDUCTOR POLLICIS, ariſes pretty large from the inner and back-part of the *Os Calcis*, and by a ſmaller Beginning from the *Os Naviculare*; thence paſſing forward contiguous to the *Os Cuneiforme majus*, becomes inſerted into the external Seſamoid Bone of the great Toe. This Muſcle is leſs an *Abductor* than a *Flexor Pollicis Pedis*, as is evident from its Inſertion into the Seſamoid Bone; it alſo very much helps to conſtrict the Foot length-ways.

TRANSVERSALIS PEDIS, ariſes from the lower End of the Metatarſal Bone of the Toe next the leaſt, and is inſerted into the internal Seſamoid Bone. This is truly an *Adductor* of the great Toe, and helps to keep the Conſtricture of the bottom of the Foot.

Muſcles of the leſſer Toes.

EXTENSOR DIGITORUM PEDIS LONGUS, ariſes acute from the upper part of the *Tibia*, and from the upper and middle part of the *Fibula* and Ligament between theſe Bones; then dividing into Five Tendons, Four of 'em are inſerted into the ſecond Bone of each leſſer Toe, and the fifth into the beginning of the Metatarſal Bone of the leaſt Toe,

and

nd ſometimes by a ſmall Tendon into the little 'oe. This laſt portion, for the moſt part, in ıch Perſons as have not been us'd to wear ſtiff hoes, is ſeparate at its beginning, and in them ay be accounted a diſtinct Muſcle. The Four rſt Tendons only of this Muſcle extend the 'oes, but all five bend the *Tarſus*, and that ith a longer Lever than any of them bend a 'oe.

EXTENSOR DIGITORUM BREVIS, iſes together with the *Extenſor Pollicis Brevis* om the *Os Calcis*, and dividing into Three ſmall endons, is inſerted into the ſecond Joynt of the ree Toes next the great one. The long Extenſors the Toes ſerve not only to extend them, t alſo contribute to the bending of the Ancle, hich Motions are uſually perform'd together Progreſſion; but the ſhort Extenſors ariſing low the Ancle, extend the Toes only; and hen the long Extenſors are imploy'd for that ction only; the Extenſors of the *Tarſus* muſt act the ſame time, to prevent the bending of the ncle; this is the reaſon why the Toes have ed, tho' their Motions are leſs, of more Exnſors than the Fingers.

FLEXOR BREVIS or PERFORATUS, iſes from the under and back-part of the *Os lcis*, thence paſſing toward the Three middle oes, divides into Three Tendons, which are ſerted into the beginning of the ſecond Bone each of the Three middle Toes. Theſe

Tendons are divided to let thro' the Tendons of the following Muſcle. Authors mention another Beginning of this Muſcle; but that is a portion of the following Muſcle.

FLEXOR LONGUS or PERFORANS, ariſes from the back-part of the *Tibia*, above the Inſertion of the *Popliteus*, and part of the *Fibula*; thence deſcending under the *Os Calcis* to the bottom of the Foot, becomes Tendinous, which part croſſes, and, in moſt Bodies, communicates with the *Flexor longus Pollicis Pedis*; then it divides into Four Tendons, (three of which paſs thro' thoſe of the *Flexor Brevis)* which are inſerted into the third Bone of each of the Four leſſer Toes. This Muſcle alſo extends the *Tarſus*. The ſecond Beginning of this Muſcle ariſes from the *Os Calcis*, and joyns the Tendons where they divide. This portion only bends the Toes.

LUMBRICALES, ariſe from the Tendons of the *Perforans*, and are inſerted into the firſt Bone of each of the leſſer Toes, which they bend.

ABDUCTOR MINIMI DIGITI PEDIS, ariſes with the *Perforatus* from the *Os Calcis*, and having a ſmall part of it inſerted into the Metacarpal Bone of the leaſt Toe, it receives two more portions, one from the *Os Cuboides*, and one from the Metatarſal Bone of the leaſt Toe, and is inſerted into the firſt Bone of the leaſt Toe, which it bends and pulls outward, and very much helps to conſtrict the bottom of the Foot.

INTEROSSEI, are ſeven Muſcles which lie like thoſe of the Hands, and ariſe like them from the Metatarſal Bones, and are inſerted like them into the laſt Joynts of the Four leſſer Toes. Their Uſe is to extend and divaricate the Toes; thoſe which bring the Toes toward the great one lying chiefly toward the upper part of the Foot, and the other toward the lower; and if we conſider that the firſt is analagous to the *Abductor Indicis* of the Hand, the Number of theſe, and thoſe of the Hand, will then be the ſame.

Tho' a great many Authors have thought it worth while to contend in many Inſtances which ſhall be call'd the Origin, and which the Inſertion of ſome Muſcles, whoſe ends have been both liable to be mov'd, yet none of them have conſider'd, that every Extenſor of the Thigh, *Tibia*, and *Tarſus*, has always had that end which is moſt mov'd, call'd its Origin, and the other its Inſertion; contrary to the Rule which all have laid down to judge by.

The Number of the Muſcles cannot be adjuſted, becauſe Anatomiſts are neither agreed about ſome of them, whether they ſhou'd be counted Muſcles or not, nor of others how far they ſhall be divided; for my own part, I am not for dividing them as far as they can be divided, but as far as is neceſſary to the Knowledge of their Uſes; accordingly I have made the following Liſt.

Of the *Abdomen*, *Penis*, *Teſtes*, *Clitoris*, *Vagina*, *Anus*, and *Os Coccygis*	18
Of the Scalp, outer and inner Ears, Eye-lids, Eyes, Mouth and Noſe	50
Of the *Os Hyoides*, Tongue, *Larynx* and *Pharynx*, Palate and Lower Jaw	47
Of the Clavicles, Shoulders, Arms and Hands	90
Of the Head and Neck	46
Of the *Thorax*	53
Of the Back and Loins	14
Of the whole Lower Limbs	84
Total	402

BOOK

BOOK III.

CHAP. I.

Of the External Parts, and common Integuments.

THE Vulgar Names of the External Parts of the Human Body being ſufficiently known for the Deſcription of any Diſeaſe or Operation; I ſhall only Deſcribe thoſe which Anatomiſts have given for the better underſtanding of the ſub-contain'd Parts.

The hollow on the middle of the *Thorax*, under the Breaſts, is call'd *Scrobiculus Cordis.* The middle of the *Abdomen* for about three Fingers breadth above and below the Navel, is call'd *Regio Umbilicalis.* The middle part above this, *Epigaſtrium.* On each ſide of the *Epigaſtrium*, under the Cartilages of the lower Ribs, *Hypochondrium*; and from below the *Regio Umbilicalis* down to the *Oſſa Ilia*, and *Oſſa Pubis*, *Hypogaſtrium.*

CUTICULA, or SCARF-SKIN, is that thin inſenſible Membrane which is rais'd by

Bliſters in living Bodies, and by actual Cauteries in dead Bodies: It is extended over every part of the true Skin, unleſs where the Nails are. That which is rais'd by Bliſters appears to me in a Microſcope a very fine ſmooth Membrane, only unequal where the *Reticulum Mucoſum* adheres to it; but that which is rais'd from dead Bodies by an actual Cautery appears like ſcorch'd Parchment. *Lewenhoeck*, and others, ſay, it appears Scaly, and compute that a Grain of Sand of the hundredth part of an inch diameter, will cover Two hundred and fifty of theſe Scales, and that each Scale has about Five hundred Pores; ſo that, according to them, a Grain of Sand will cover 125000 Pores, thro' which we perſpire. Its Uſe is to defend the true Skin that it may not be expos'd to Pain from whatever it touches; and alſo to preſerve it from wearing: On this account it is ſo contriv'd, as to grow in proportion to the Friction it receives; and is therefore thickeſt on thoſe parts of the bottom of the Foot which ſuſtain the Body; and in Hands much us'd to Labour; and thinneſt of all on the Lips, if that Membrane may be call'd *Cuticula*.

Between this and the true Skin, is a ſmall quantity of ſlimy Matter, which was ſuppos'd, by *Malpighi*, and others, to be contain'd in proper Veſſels, interwoven with one another, and therefore by them nam'd *Reticulum Mucoſum*; but, for my own part, I have never been able

ble to diſcern in the beſt Microſcopes any uch Figure or Veſſels; it is moſt conſiderable here the *Cuticula* is thickeſt, and is black, white, r duſky, ſuch as is the Complexion; the Colour f this, and the *Cuticula*, being the only difference etween *Europeans*, and *Africans* or *Indians*, he Fibres of the true Skin being white in all Ien; but the florid Colour of the Cheeks, is wing to the Blood in the minute Veſſels of he Skin, and that in the Lips to the Veſſels n the Muſcular Fleſh; for the *Cuticula* being nade of excrementitious Matter, has no Veſels.

CUTIS, or TRUE SKIN, is a very comact, ſtrong, and ſenſible Membrane, extended ver all the other Parts of the Body, having Ierves terminating ſo plentifully in all its uperficies, for the Senſe of Touching, that the ineſt pointed Inſtrument can prick no where ithout touching ſome of them. Theſe Nerves re ſaid to terminate in ſmall Pyramidal *Papillæ*, ut I can diſcern no ſuch appearance in the beſt Iicroſcope; and to me it ſeems, that a plain uperficies of the Skin (I do not mean Mathenatically plain) is much fitter and more agreeble to what we experience of this Senſation; or a plain ſuperficies expoſing all the Nerves like, will give an equal Senſation, while Nerves nding in a Pyramidal *Papilla* wou'd be exeeding Senſible at the *Vertex* of that *Papilla*; nd thoſe at the Sides and round the Baſe, which wou'd be far the greateſt part, wou'd be in a manner uſeleſs.

GLANDULÆ MILIARES, are ſmall Bodies like Millet Seeds, ſeated immediately under the Skin in the Axilla's; and are ſaid to have been found under all other Parts of the Skin where they have been look'd for, with Microſcopes: As for the firſt of theſe, if they are Glands, they are of an extraordinary kind, for they melt like Fat; and thoſe little Bodies that adhere to a bit of Skin carefully Diſſected, to me have the very ſame appearance in a Microſcope with bits of Fat of equal Magnitude, taken from any other Part. Theſe Glands, if they are ſuch, are ſuppos'd to ſeparate Sweat; which Fluid was formerly thought to be only the *Materia Perſpirabilis* flowing in a greater quantity, and condens'd, but *Sanctorius* has aſſur'd us, that it is not ſo, and that more of the *Materia Perſpirabilis* is ſeparated in equal times than of Sweat; of the former, he ſays, uſually fifty two ounces a Day at *Rome*, where his Experiments were made, and of the latter not near ſo much in the moſt profuſe Sweats; which, I think, favours the Opinion of the exiſtence of theſe Glands, unleſs the Sweat being once condens'd upon the Skin, prevents a greater effuſion of that Matter. Now that the whole Body, every part of which is moſt certainly Perſpirable, ſhou'd perſpire fifty two ounces in a natural Day, is not at all incredible;

and perhaps that Maſs of Sweat may be theſe two diſtinct Fluids, as *Sanctorius* calls them, joyn'd together. I wiſh thoſe who have more Leiſure and Judgment than my ſelf, wou'd examine theſe Glands, (if they are ſuch) more nicely, becauſe ſo much Theory of Cutaneous Diſeaſes depends upon their exiſtence.

MEMBRANA ADIPOSA, is all that Membrane immediately under the Skin, which contains the Fat in Cells; it is thickeſt on the *Abdomen* and Buttocks, and thinneſt neareſt the Extremities; and where the Muſcles adhere to the Skin, and on the *Penis*, none. It contributes to keep the inner Parts warm, and by filling the Interſtices of the Muſcles, renders the Surface of the Body ſmooth and beautiful.

MAMMÆ, the BREASTS, are of the ſame ſtructure in both Sexes, but largeſt in Women. They are a number of ſmall Glands to ſeparate Milk, ſeated in the *Membrana adipoſa*, with their Excretory Ducts, which are capable of very great Diſtention, tending toward the Niple, which as they approach, they unite, and make but a few Ducts at their exit. There are to be met with in Authors, Inſtances, ſufficiently atteſted, of Mens giving Suck, when they have been excited by a vehement Deſire of doing it. And it is a common Obſervation, That Milk will flow out of the Breaſts of new-born Children, both Male and Female.

I have known an Inſtance of a Bitch giving Suck to the Puppies of another, when herſelf has had none, nor given Suck to any for more than a Year before.

CHAP. II.

Of the MEMBRANES *in general.*

EVERY diſtinct Part of the Body is cover'd, and every Cavity is lin'd with a ſingle Membrane, whoſe thickneſs and ſtrength is as the bulk of the Part it belongs to, and as the Friction to which it is naturally expos'd.

Thoſe Membranes that contain diſtinct Parts, keep the Parts they contain together, and render their ſurfaces ſmooth, and leſs ſubject to be lacerated by the Actions of the Body. And thoſe which line Cavities, ſerve to render the Cavities ſmooth, and fit for the Parts they contain to move againſt.

The Membranes of all the Cavities that contain ſolid Parts, are ſtudded with Glands, or are provided with Veſſels, which ſeparate a *Mucus* to make the Parts contain'd move glibly againſt one another, and not grow together. And thoſe Cavities which are expos'd to the Air, as the Noſe, Ears, Mouth, and *Trachea Arteria*, have their Membranes beſet with Glands, which ſeparate Matter to defend them from om the outer Air. Thoſe Membranes that ive proper Names, and deſerve a particular eſcription, will be treated of in their proper aces.

CHAP. III.

Of the SALIVARY GLANDS.

PAROTIS or MAXILLARIS SUPERIOR, is the largeſt of the Salivary lands; it is ſituate behind the Lower Jaw, nder the Ear; its Excretory Duct paſſes over e upper part of the *Maſſeter* Muſcle, and nters the Mouth thro' the middle of the *Buc-nator*. This Gland has its *Saliva* promoted by e Motions of the Lower Jaw. The Duct of is Gland paſſes over the Tendinous part of e *Maſſeter* Muſcle that it may not be com-eſs'd by that Muſcle, which wou'd obſtruct e *Saliva* in it, tho' it is frequently ſaid that it aſſes over that Muſcle that it may be com-eſs'd by it to promote the *Saliva*. In Sheep nd Calves, their Jaws being long, this Muſcle inſerted far from the Center of Motion, at it may have ſufficient ſtrength at the nd of ſo long a lever of Reſiſtance, and that ſtant inſertion requiring a greater length of uſcle, that its Motion may be quick enough, no part of this Muſcle cou'd be allow'd to be Tendinous, therefore, to avoid the inconvenience of Compreſſion from the Muſcle, this Duct in thoſe Animals goes quite round the lower end of it. When this Duct is divided by an external Wound, the *Saliva* will flow out on the Cheek, unleſs a convenient Perforation be made into the Mouth, and then the external Wound may be heal'd. I have ſeen Two Patients with this Gland Ulcerated, from which there was a conſtant effuſion of *Saliva*, 'till the greateſt part of the Gland was conſum'd with *Red Mercury Precipitate*, and then it heal'd with little trouble. *Hildanus* mentions the ſame Caſe, which for Two Years had been under the Care of a Surgeon without Succeſs; and was at laſt cur'd by the Application of an actual Cautery.

MAXILLARIS INFERIOR, is ſituate between the Lower Jaw, and the Tendon of the Digaſtrick Muſcle; its Duct paſſes under the *Muſculus Mylohyoideus*, and enters the Mouth under the Tongue, near the *Dentes Inciſorii*. I was at the opening of a Woman who was Suffocated by a Tumor which begun in this Gland; it extended itſelf from the *Sternum* to the Parotid Gland on one ſide in Six Weeks time, and in Nine Weeks kill'd her. It was a true Schirrous, and weigh'd Twenty ſix Ounces. In a Man which I Diſſected, I found a quantity of *Pus* near this Gland, and a Bundle of Matter not unlike Hair, as large as an Hen's Egg.

SUBLINGUALIS, is a ſmall Gland ſituated under the Tongue, between the Jaw and the *Ceratagloſſus* Muſcle; it ſends its Duct into that of the *Maxillaris Inferior.*

TONSILLA, is a Globular Gland about the bigneſs of a Hazel-Nut, ſituate upon the *Pterygoideus Internus* Muſcle, between the Root of the Tongue and the *Uvula*; it has no Duct continued from it, but empties all its ſmall Ducts into a *Sinus* of its own, which *Sinus*, when the Gland is inflam'd, may eaſily be miſtaken for an Ulcer. This Gland with its Fellow, direct the maſticated Aliment into the *Pharynx*; and alſo ſerve for the *Uvula* to ſhut down upon when we breathe thro' the Noſe. They are compreſs'd by the Tongue and the Aliment, when the former raiſes the latter over its Root, and thereby opportunely emit their *Saliva* to lubricate the Food for its eaſier deſcent thro' the *Pharynx*. A Schirrous Tumor of either of theſe Glands is a common Diſeaſe, and it admits of no Remedy but Extirpation; yet it muſt not be perform'd upon the whole Gland, but ſo much of it as is become ſupernaturally eminent; becauſe that wou'd be very dangerous as well as difficult, and render it unfit for the afore-mention'd Uſes. I once ſaw them totally deſtroyed by Venereal Ulcers, and the Palate, which was whole, having nothing to ſhut againſt, the Patient ſnuffled almoſt as much as if the Palate had been gone.

The Gland in the Orbit of the Eye has been eſteem'd a Salivary Gland, but I take it to be the Lachrymal Gland; and ſhall treat of it with the Eye.

Preſſure upon the Surface of a Gland very much promoting the Secretion that is made in it, theſe Glands are ſo ſeated as to be preſs'd by the Lower Jaw, and its Muſcles, which will be chiefly at the time when their Fluid is wanted; and the force with which the Jaw muſt be mov'd, being as the drineſs and hardneſs of the Food maſticated, the Secretion from the Glands depending very much upon that force; it will alſo be in proportion to the drineſs and hardneſs of that Food, which is neceſſary; for all Food being to be reduc'd to a pulp, by being mix'd with *Saliva* before it can be ſwallow'd fit for Digeſtion, the drier and harder Foods needing more of this Matter, will from this Mechaniſm be ſupplied with more than moiſter Foods in about that proportion in which they are drier and harder; and the drier Foods needing more *Saliva* than moiſter, is the Reaſon why we can eat leſs, and digeſt leſs of theſe than thoſe. What quantity of *Saliva* theſe Glands can ſeparate from the Blood, in a given time, will be hard to determine, but in eating of dry Bread it cannot be leſs than the weight of the Bread; and many Men, in a little time, can eat more dry Bread than twice the ſize of all theſe Glands; and ſome Men, that are not us'd to Smoaking, can ſpit half a Pint in the ſmoaking one Pipe of Tobacco; and many a Man, in a Salivation, has ſpit, for Days or Weeks together, a Gallon in Four and twenty hours; and yet, I believe, all theſe Glands put together, do not weigh more than four Ounces.

The Membrane which lines the Mouth and Palate, and covers the Tongue, is every where beſet with ſmall Glands, to afford *Saliva* in all parts of the Mouth to keep it moiſt; for thoſe more remote, are chiefly concern'd in time of Maſtication. Theſe ſmall Glands have Names given 'em according to their reſpective ſituations, as *Buccales*, *Labiales*, *Linguales*, *Fauciales*, *Palatina*, *Gingivarum*, *Uvulares*.

CHAP. IV.

Of the PERITONEUM, OMENTUM, DUCTUS ALIMENTALIS *and* MESENTERY.

PERITONEUM, is a Membrane which lines the whole Cavity of the *Abdomen*. It contains the Liver, Spleen, Omentum, Stomach, Guts and Meſentery, with all their Veſſels and Glands; the upper part of it is no other than the proper Membrane of the Diaphragm, and, but for compliance with Cuſtom, there is no more reaſon for calling that, part of the *Peritoneum*, than there is for calling the Membrane on the other ſide of the Diaphragm part of the *Pleura*, or *Mediaſtinum.* The fore-part, next the Muſcles of the *Abdomen*, and their Tendons, is as much a ſingle Membrane as any whatever of equal Solidity; and thoſe Authors who call it double, have always plainly deſcrib'd the Tendons and proper Membranes of the Abdominal Muſcles for part of it; that part of it next the Back and Loins, may be ſaid to be double: In its Parts are contain'd the *Pancreas*, the Kidneys, the great Artery and Vein, with their Iliac Branches, all the Spermatic Veſſels, the Ureters, and other Parts of leſs Note; and to the middle of it, upon the Loins, is join'd the Meſentery in ſuch a manner, as made the Ancients look upon it to be a production of the *Peritoneum*, agreeably to their Hypotheſis of Generation. The lower part of this Membrane lines the *Pelvis* of the *Abdomen*, and covers, and in a manner incloſes the Bladder of Urine, and part of the *Inteſtinum Rectum*; but in all theſe Places where it is double it is ſo indiſtinctly ſo, that we cannot ſay preciſely where one *Lamina* ends, and the other begins, except in thoſe Places where Parts are contain'd. In the Dropſie of the *Peritoneum*, the Water is contain'd between the *Peritoneum*, and the Muſ-

les of the *Abdomen*, with their Tendons: This
ind of Dropſie may be always known, by be-
ng leaſt prominent about the Navel, for there
he Tendon and the *Peritoneum* will not ſepa-
ate; and the Water, in thoſe that I have Diſ-
ected, had made the Parts where it was con-
ain'd as foul as any Ulcer; therefore none of
hem cou'd poſſibly have been cur'd by Operation.

For the *Umbilical Veſſels*, See Chap. *Of the*
œtus. For the *Proceſſus Vaginalis*, Chap. *Of the*
arts of Generation in Men.

OMENTUM, or CAWL, is a fine Mem-
rane larded with Fat, ſomewhat like Net-
ork: It is ſituated on the ſurface of the ſmall
uts, and reſembles an Apron tuck'd up; its
uter or upper part, nam'd *Ala ſuperior*, is con-
ected to the bottom of the Stomach, the
pleen, and part of the *Inteſtinum duodenum*; and
ence deſcending a little lower than the Navel,
reflected and ty'd to the *Inteſtinum Colon*, the
pleen, and part of the *Duodenum*: This laſt
art is call'd *Ala inferior*; and the Space between
he *Alæ* is nam'd *Burſa*. This Cavity is very
iſtinct in moſt Brutes, but ſeldom ſo in Men.
ometimes both *Alæ* are ty'd to the Liver, and,
n diſeas'd Bodies, to the *Peritoneum*. Its Uſe
, to lubricate the Guts, that they may
e better perform their Periſtaltick Motion.
n Dropſies of the *Abdomen*, and in Perſons
ho from any other Cauſe have dy'd Tabid,
is generally rotten and decay'd; and ſome-

times theGuts in theſe Caſes adhere to one another But whether theſe Adheſions proceed from the *Omentum*'s ceaſing to perform its Office, or from the Periſtaltick Motion of the Guts, being long diſcontinu'd thro' Abſtinence, or both, I cannot determine. I have ſeen one inſtance, from Diſſection, of a very large Rupture of the *Omentum*, or *Epiploon*, into the Groin, together with one of the Guts; the Rupture of the *Omentum*, is call'd by Authors *Epiplocele.*

DUCTUS ALIMENTALIS, is the *Œſophagus*, Stomach, and Guts, *viz. Duodenum*, *Jejunum*, *Ilium*, *Colon*, *Cæcum* or *Apendicula Vermiformis*, and *Rectum.*

ŒSOPHAGUS, or GULLET, is the Beginning of the Alimentary Duct; its upper part is wide and open, ſpread behind the Tongue to receive the maſticated Aliment; it begins from the Baſis of the Scull, near the *Proceſſus Pterygoides* of the Sphenoidal Bone, which part is call'd by ſome Anatomiſts *Muſculus Pterygopharyngeus*; this deſcending becomes round, and is call'd *Vaginalis Gulæ*; it runs from the Tongue cloſe to the Spine, under the left *Subclavian* Blood-Veſſels, into and thro' the *Thorax* on the left ſide under the great Artery, then piercing the Diaphragm, it immediately enters the Stomach. It is compos'd of a thin outer Coat, which is no more than a proper Membrane to the middle or Muſcular Coat. The middle Coat, is compos'd of a Spiral Order of Muſcu-

lar

ar Fibres, abundantly thicker than the ſame oat in the Guts; becauſe this has no foreign ower to aſſiſt it, as the Guts have, and beauſe it is neceſſary the Food ſhou'd make a orter ſtay here than there. The inner Coat, a pretty ſmooth Membrane, beſet with many lands, which ſecrete a mucilaginous Matter, hich defends this Membrane, and renders e deſcent of the Aliment eaſy.

Tab. xii. 6.

VENTRICULUS, the STOMACH, is ſiuated under the left ſide of the Diaphragm, s left ſide touching the Spleen, and its ght is cover'd by the thin Edge of the Liver; s Figure nearly reſembles the pouch of a ag-pipe, its left End being moſt capacious, the pper Side concave, and the lower convex; has two Orifices, both on its upper part; e left (thro' which the Aliment paſſes into e Stomach) is nam'd *Cardia*; and the right thro' which it is convey'd out of the Stomach to the *Duodenum*) is nam'd *Pylorus*; where ere is a circular Valve which hinders a return Aliment out of the Gut, but does not wholly nder the Gall from flowing into the Stomach. The Coats of the Stomach are but Three; e external Membranous, the middle Muſcular, oſe Fibres are chiefly Longitudinal and rcular, the inner Membranous, and beſet th Glands, which ſeparate that Mucous, which falſly call'd *Membrana Quarta* or *Villoſa*. the Muſcular Coat of the Stomach contracts,

tracts, the inner Coat falls into folds, which encreaſe as the Stomach leſſens, and conſequently retard the Aliment moſt when the Stomach is neareſt being Empty.

The manner in which Digeſtion is perform'd, has been matter of great controverſy. The Ancients generally ſuppoſed the Food concocted by a fermentation in the Stomach: But the Moderns more generally attribute it to the Muſcular force of the Stomach; which Dr. *Pitcairne* has computed to be equal to a Hundred and ſeventeen thouſand and eighty eight Pound weight, to which being added the abſolute force of the *Diaphragm* and *Abdominal* Muſcles; (but for what reaſon I am at a loſs to conceive, when ſo ſmall a part of that force can be exerted this way) the Sum then will be more than twice as much; a force indeed equal to the end for which he aſſigns it. Now this force of the Muſcular Coat of the Stomach is near Forty times greater then what *Borelli* has aſſign'd to the Heart, which is much ſtronger; and Dr. *Keil* has undertook to prove, that the force which the Heart exerts is not Thrice as many Ounces as *Borelli* computes it to be Thouſand Pounds weight. And this is as certain as that action and reaction are the ſame; that the *Abdominal* Muſcles and the *Diaphragm*, compreſs the Stomach with no greater force than they do the Liver and all other parts contain'd in the *Abdomen*; and that

at the *Fœtus in Utero*, and all the *Viſcera*
the *Abdomen*, receive as much more of this
rce, during the time of Geſtation, as the
gn of the Angle, at which the Muſcles of the
bdomen act, is encreaſed during that time;
d yet neither the *Fœtus*, nor any other con-
in'd part, is digeſted by that force; and for
e force with which the Stomach it ſelf acts,
will be juſt the ſame with the reaction of
e Food upon it, and therefore ſhould be as
uch more liable to be Digeſted by this and
e other force than the Food, as it oftner
els theſe forces than that, (only that living
odies are not ſo liable to Digeſtion as
ad ones): Beſides, I think it may be de-
onſtrated, that the force with which the Sto-
ach compreſſes any part of its contents, is
t greater than what is given to equal parts
the contents in the ſmall Guts; for if the
oment of a Muſcle is as its weight, and if
e Muſcular Coat of the Stomach does not
ar a greater proportion to the Muſcular
oat of a ſmall Gut, than their Diameters
ar; a Section of the Stomach, having ſo
any more equal parts to preſs than a like
ction of a Gut; it will require juſt ſo much
ore force to give each part the ſame preſſure.
r. *Drake* has ſuppoſed, that Digeſtion is per-
rm'd in the Stomach, as in *Papins* Digeſter,
which Hypotheſis are contained all the abſur-
ties of that of *Pitcairnes*, with this Addition,

that

that the Stomach muſt be as irreſiſtable to diſtention at that time, as his Iron Pot, and the Orifices as forcibly ſecured; but then indeed it ſhews how bits of Bones, which Dogs ſwallow may be retained in the Stomach without tearing it; which difficulty, in my Opinion, Dr. *Pitcairne* has not ſufficiently accounted for, tho' it is one of the greateſt in his Hypotheſis. In Granivorous Birds, where Digeſtion is made by Muſcular force, their ſecond Stomach is plainly contriv'd for comminuting or digeſting their Food that way; for beſides that it is much the ſtrongeſt Muſcle of their Bodies, its inſide is defended with a prodigious hard and ſtrong Membrane that it may not be torn; and theſe Birds always Eat with their Grane the rougheſt and hardeſt little Stones they can find, which are neceſſary for grinding their Food, notwithſtanding it is firſt ſoaked in another Stomach, and is alſo Food of very eaſie Digeſtion; in *Snakes*, ſome Birds, and ſeveral kinds of Fiſh, which ſwallow whole Animals, Digeſtion ſeems to be performed by a *Menſtruum*, for we frequently find in their Stomachs Animals ſo totally Digeſted, before their form is deſtroy'd, that their very Bones are made ſoft. In Horſes and Oxen, Digeſtion is but little more than extracting a Tincture; for in their Excrements, when voided, we ſee the Texture of their Food is not totally deſtroy'd, tho' Graſs in particular ſeems to be of as eaſy digeſtion as any Food whatever;

and

nd the Corn they eat is often voided unbroke, nd in the Excrements of Men, are often ſeen the kins of Fruits undigeſted. Now if in Men dieſtion was made either by Attrition, or a Menruum, or Fermentation only, I neither ſee how ie Stomach and Guts cou'd eſcape being injur'd, id Worms in theſe *Viſcera* digeſtion: All hich conſiderations lead me to think that it is fected in Men by a very moderate ſhare of each theſe, and perhaps aſſiſted by that principle Corruption which is in all Dead Bodys.

DUODENUM, is the firſt of the Three nall Guts; it begins from the *Pylorus* of the omach, and is thence reflected downward; firſt paſſes by the Gall-Bladder, and then ider the following Gut and Meſentery, and oming in ſight again in the left *Hypochondrium*, there commences *Jejunum*, which is the ſeond of the ſmall Guts; but the place where iis ends and the other begins, cannot be preſely determin'd. This great length of ſmall uts is evidently for the convenience of a greanumber of *Lacteals*, that the *Chyle* which iſſes their Orifices in one place, may be eſs'd into them in another.

JEJUNUM, is ſo call'd from its being und for the moſt part empty; it's ſituated the *Regio Umbilicalis*, and makes ſomeiat more than a third part of the ſmall Guts. may be known from the following Gut by s Coats, which are a ſmall matter thinner, id leſs pale. Tab. xii. 7.

ILE-

Tab. xii. 7. **ILEUM**, is the Continuation of the former, ſituated in the *Hypogaſtrium*, and very often ſome part of it in the *Pelvis* of the *Abdomen*, upon the Bladder of Urine eſpecially: In Women, it enters the *Colon* on the right Side, near the upper Edge of the *Os Ilium*.

COLON, is the firſt of the great Guts; it begins at the upper Edge of the right *Os Ilium*; thence aſcending, paſſes under ſome part of the Liver, and the bottom of the Stomach, from the right *Hypochondrium* to the left, and thence deſcends to the *Pelvis Abdominis*.

CŒCUM, or *Apendicula Vermiformis*, is ſituated on the Beginning of the *Colon*; it is leſs than an Earth-worm, with a ſmall Orifice opening into the *Colon*. This Gut has ſeldom any thing in it. In Men it is call'd one of the large Guts, tho' it is the ſmalleſt by far; but this Miſtake ariſes from Authors Copying the Ancients, whoſe deſcriptions of all the Parts contained in the *Abdomen*, are evidently taken from Dogs, for in them and in many other Animals, it is very large: And ſome Fiſh have them in great numbers; I have counted in a Mackarell above 150.

RECTUM, is the Continuation of the *Colon* thro' the *Pelvis* to the *Anus*.

The Guts have the ſame Coats with the Stomach; the Fibres of their middle or Muſcular Coat, are Circular, or Spiral, and Longitudinal, of the latter but very few. The

Antagoniſts to theſe Múſcular Coats of the Stomach and Guts, are the Muſcles of the *Abdomen*, for theſe preſſing upon them alter their form, into one leſs capacious; which neceſſarily extends their circular Fibres. The great Guts have three Membranes, or Ligaments, on the outſide running their whole lengths, and ſupporting the *Saculi*, into which thoſe Guts are divided. The leſſer Guts, have at very ſmall diſtances Semilunar Valves plac'd oppoſite to the Interſtices of each other; they prevent the Aliment from paſſing too ſpeedily through the Guts; and the better to anſwer that end, they are larger and more numerous near the Stomach, where the Food is thinner, than they are towards the *Colon*, where the Food is continually made thicker in its progreſs, by a diſcharge of part of the *Chyle*. But Brutes have 'em not, becauſe they are not neceſſary to an Horizontal Poſture. At the Entrance of the *Ileum* into the *Colon*, are Two very large Valves, which effectually hinder the regreſs of the *Fæces* into the ~~*Colon*~~; but *Clyſters* have been frequently Ileum known to paſs them, and be Vomited up, but the Excrement that is ſometimes Vomited up, I am inclined to think, is ſuch as had not paſs'd into the great Guts: The other Valves in the *Colon*, are plac'd oppoſite (but not in the ſame Plaſe) to each other, and make with n their anterior Edges an Equilateral Triangle;

but as the Gut approaches the *Anus*, they become leſs remarkable, and fewer in number.

All the Guts have in their inner Membrane an almoſt infinite number of very ſmall Glands: Theſe Glands will, ſome of 'em eſpecially in the large Guts, appear to the naked Eye when they are diſeas'd: They are call'd *Glandulæ Pyerianæ.*

The length of the Guts to that of the Body is as Five to One, in a middle-ſiz'd Man; in taller Men, the proportion is leſs, and in ſhort Men greater.

The following Caſe I had thus related (in preſence of a great many Gentlemen who had ſeen the Caſe) from Mr. *Punt* of *Cambridge*, a Gentleman, when Living, well known for his great Skill in *Surgery.*

"I was call'd to a Poor Woman, a few "Years ſince, with a Mortification upon the "*Abdomen.* I cut away the Mortified part, "and found ſome of the ſmall Guts Mortified. "I cut off ſo much of them as could not "be ſaved, and ſtitch'd the ſound part of "the Gut, to a ſound part of the Wound, "near the Navel; to which it afterward ad"her'd, and ſhe recovered and voided her "Excrement that way, without any notable "inconvenience; and at every Stool part of "the Gut would thruſt out, without any Pain, "like a *Prolapſus Ani:* But about a Year

‘ after the Cure, ſhe died of the Stone.” I do ot remember that he told me what cauſed his Mortification, but my Honoured Friend r. *Folkes*, who lets nothing Curious ſcape is Obſervation, and was at that time of *lare-Hall* in *Cambridge*, has inform'd me, ‘ That the Mortification was made by laying ‘ hot Bricks to her Belly, for the *Colick*, ‘ ſome of which Burnt her, and when the ‘ Slough caſt off a Gut appearing, a Female ‘ Surgeon took it for a Bliſter and clip'd it, ‘ upon which the Excrement came out of the ‘ Wound, and then they ſent for Mr. *Punt*.

The following Caſe, was of a Patient to r. *Walter*, a *Surgeon*, at *Lewis* in *Suſſex*, hom I have heard relate it; but for this Acount, as well as the Cut, I am obliged to his ucceſſor in that Town, my Ingenious Friend r. *Ruſſel*; but I cannot be of Mr. *Walter*'s Opiion, that it was the *Colon* that was Mortified.

SIR,

MRs. *Stoneſtreet*, of *Lewis* in *Suſſex*, had “ the *Exomphalos* above Twenty Years, before it was attended with the following Accident. In the Year, 1700. the 28*th* of *May*, She was taken with a *Colick*, and a total ſuppreſſion of Stools; the *Inteſtine* Mortified, and part of it was taken off by Mr. *Walter*, a *Surgeon*, who gave me an account of the Caſe, and aſſured me it was *Tab.* xxi.

" the *Colon*; the other part was thruſt out " daily by the *Periſtaltick* motion of the Guts, " when the Excrements were voided, till it " adher'd to the Wound; and had the juſt " appearance of what is expreſs'd in the Pi- " cture I ſent you. I had a perfect Exami- " nation of it in her Life-time, but no op- " portunity of Opening her after Death; the " Sides of the *Inteſtine* firmly adhered to the " Belly, and the part which hung out, look'd " like a pale Scarlet Strawberry, that had " not it's full Ripeneſs; and the Coats of " it were extreamly Thickened; ſhe lived " in this Condition Twelve Years, and Died " of a *Fever*, with *Scorbutick* Swellings in her " Leggs.

I am Sir, &c.

RICH. RUSSEL.

But for a Caſe nothing inferior to either of theſe, I am oblig'd to a *Farrier*, or Dr. for Cattle, as he ſtiles himſelf: The Truth of this Caſe is known to Numbers of Perſons; as Mr. *Hunt*, a Gentleman of unqueſtionable Veracity has informed me, before whom the following Account was given upon Oath.

" THomas *Brayn*, of *Yeaton*, in the " Pariſh of *Baschurch*, and County of " *Salop*, a Doctor for Cattle, maketh Oath, " That about Ten or Twelve Years agone, he

" was ſent for by a Farmer or Husbandman,
" who lived near the Village called *Maesbrooks*,
" and very near to the River *Verney*, in the ſaid
" County of *Salop*, to have his Advice about
" an Ox he had, which was there Sick by reaſon
" he could not Dung; he had been drenched
" by ſeveral Beaſt Doctors; before this Deponent
" came to him; this Deponent ſeeing this
" Ox in the Condition he was in, told the
" Owner, that if he would venture his Ox, he
" would do him what Service he could, in the
" Curing of him; which the Owner conſented
" to, and thereupon this Deponent opened the
" Ox in the Flank, and took out great part
" of his Bowels, upon Searching of which, he
" found there was a perfect Stoppage in the
" Guts; and the Gut was about the Stoppage
" putrifyed for about three quarters of a Yard,
" whereupon this Deponent Cut off ſo much of
" the Gut as was putrifyed, and took it quite
" away, and then drew the ends of the Guts
" which remained Sound after what was Cut off,
" together upon a hollow keck, which was about
" Three or Four Inches long, and Sewed the
" ſaid ends of the Guts together upon the ſaid
" keck, leaving the keck within the Guts; and
" then Sewed up the hole cut in the hide upon
" the Flank of the ſaid Ox; and this Deponent
" further ſaith, that within the ſpace of one
" Hour after this Operation was performed,
" the Ox Dunged; and the piece of the keck

" which the ſaid ends of the Gut were Sewn
" upon and left within the Guts, came away
" from the Ox with the Dung, whereupon the
" Ox recovered, and lived to do the Owner
" Service, ſeveral Years.

Jurat Decimo Septimo Die Julij Anno Dom. 1716. *coram* Thomas Hunt.

The Mark of
═
Thomas Brayn.

MESENTERY, is a Membrane beginning looſely upon the Loins, and is thence produced to all the Guts: It preſerves the *Jejunum* and *Ileum* from twiſting in their Periſtaltick or Vermicular Motion, and confines the reſt to their Places; it ſuſtains all the Veſſels going to and from the Guts, *viz.* *Arteries*, *Veins*, *Lymphæducts*, *Lacteals* and *Nerves*, and alſo contains many Glands, call'd from their ſituation *Meſentericæ*. The beginning of this Membrane from the Loins, is about Three or Four Inches broad, but next the Guts of the ſame length, with the ſide of the Guts they adhere to, which is in the ſmall Guts about a fourth Part ſhorter than the other ſide; but when this Membrane is ſeparated from the ſmall Guts, it ſhrinks, and meaſures about two Thirds leſs.

I open'd a Boy about Twelve Years Old, that died of the *Iliac Paſſion*; the Guts, Stomach, *Duodenum* and *Jejunum* were diſtended, with Vapour and Air, to near Ten times their natural capacity, which ſo compreſſed the *Inteſtinum Ileum*, that nothing could paſs through it. The Relations of this Boy could give no other account of the Cauſe of this Diſeaſe, than that of his having eaten a large quantity of raw young Carrots. This Caſe happens very frequently to Lambs that have been Houſed, and turn'd out early in the Spring to Graſs, when the Graſs is very Rank and Succulent; and alſo to Horſes, Oxen and Sheep, when they happen to Feed by any accident, upon young Beans or Peas, or rich Clover Graſs, which are full of Air, and very apt to Ferment, and expand in their Stomachs: In theſe Animals this Caſe is commonly Cured by running a Knife into their Guts, ſome inſtances of which I have ſeen, and have heard a great many reported; but this Caſe happening very rarely to Men, and being to be Cur'd ſometimes by the ſwallowing of Crude *Mercury*, I believe that Practice has never yet been us'd; tho' the Inſtrument which is uſed for Tapping in a *Dropſie* of the *Abdomen*, would do it with great eaſe and ſafety. Some Anatomiſts, who have conſider'd the impoſſibility of a Twiſting of the Guts, (which is the Vulgar name of this Diſeaſe) have imagined that it proceeded from one Gut being involv'd in another, but theſe Involutions, are found in moſt Bodies that Die a natural Death; and without any Inflamation, or any other Symptom of Pain.

CHAP. V.

Of the LIVER, GALL-BLADDER, PANCREAS *and* SPLENE.

Tab. {xii. 5. xiii. A} THE LIVER, is the largeſt Gland in the Body, of a dusky-red Colour, it is ſituated immediately under the *Diaphragm* in the right *Hypochondrium*; its exterior ſide is convex, and interior concave; backward toward the Ribs it is thick, and thin on its forepart, where it covers the upper ſide of the Stomach, and ſome of the Guts; the upper ſide of it adheres to the *Diaphragm*, and is alſo ty'd to it and the *Sternum* by a thin Ligament, which is deſcrib'd commonly as Two; the upper part call'd *Suſpenſorium*, and the anterior *Latum*; but either of theſe Names is ſufficient for it all: It is alſo ty'd to the Navel by a round Ligament call'd *Teres* or *Umbilicale*, which is the Umbilical Vein degenerated into a Ligament; it is inſerted into the Liver at a ſmall Fiſſure in its lower Edge.

dge. The *Ligamentum Latum* or *Suſpenſorium*,
uſtains the Liver in an erect Poſture, or rather
ixes it in its Situation, while it is ſupported by
he other *Viſcera*, they being compreſs'd by the
bdominal Muſcles; in lying down, the *Teres*
revents it from preſſing on the *Diaphragm*;
nd in lying on the Back, they both together
uſpend it, that it may not compreſs and obſtruct
he aſcending *Vena Cava*. Its Blood-Veſſels,
hat compoſe it as a Gland, are the *Porta* (which
eceives Blood from all the Parts contain'd in
he *Abdomen* (*Vid. Vena Portæ*) and here re-di-
tributes it to have the Bile ſecreted from it),
nd the Branches of the *Cava* in the Liver,
hich return the redundant Blood into the *Cava*
ſcendens; it has alſo Arteries call'd *Hepaticæ*, *Tab.* xviii. 7, 8.
nd ſeveral Branches of Nerves, and a great
umber of Lymphaticks: Of which I ſhall
eat in their reſpective Places. Dogs and
ats, and other Animals, that have a great deal
f Motion in their Backs, have their Livers
ivided into many diſtinct *Lobules*; which by
oving one upon another, comply with thoſe
otions, which elſe would break their Livers
Pieces.

The GALL-BLADDER, is a receptacle of *Tab.* {xiii B. xviii. 3.
ile, ſeated in the hollow-ſide of the Liver;
is compos'd of one denſe Coat ſomewhat
uſcular, which is covered with a Membrane
ke that of the Liver; and is alſo lin'd with
nother, that cannot eaſily be ſeparated.

Modern Anatomiſts have deſcrib'd a parcel of ſmall Ducts leading from the Liver to the Gall-Bladder, by which they ſuppoſe the Gall-Bladder is fill'd, and theſe I thought I had ſeen in a Body that died of a Jaundice, when I was a very young Anatomiſt; but never being able to ſee any ſince in any Animal, tho' I have made very diligent enquiry by Experiments and Diſſection. I begin now to be very much perſwaded that there are no ſuch Ducts, for if they are too little to be ſeen or fill'd by Injections, I think they are much too little for the end for which they are aſſign'd: As to the Argument for the exiſtance of ſuch Ducts, which is fetch'd from the difficulty of the Gall-Bladders, being fill'd thro' the *Ductus Cyſticus*, from the *Ductus Hepaticus*, I think it is of no weight, becauſe the *Veſiculæ ſeminales*, we know are fill'd with a thicker fluid thro' a leſs direct paſſage. From the Gall-Bladder towards the *Duodenum*, runs *Tab.* xviii 4. a Duct call'd *Cyſticus*; and from the Liver to *Tab.* xviii. 1. this Duct, one call'd *Hepaticus*, which carries off the Gall this way, when the Gall-Bladder is *Tab.* xviii. 5. full; then the *Ductus Cyſticus* and *Hepaticus* being united, commence *Ductus communis Choledocus*, which enters the *Duodenum* obliquely about Four Inches below its Beginning. The Orifice of this Duct in the Gut, is ſomewhat eminent, but has no Caruncle, as is commonly ſaid. As the Liver from its ſituation in the ſame Cavity with the Stomach, will be moſt preſs'd and nd conſequently ſeparate moſt Gall when the tomach is fulleſt ; which is the time when it is noſt wanted. So the Gall-Bladder being ſeated gainſt the *Duodenum*, it will have its Fluid reſs'd out by the Aliment paſſing thro' that ut, and conſequently at a right Time, and in ue Proportion ; becauſe the greater that quan-ity of Aliment is, the greater will be the Com-reſſion ; and ſo the contrary.

PANCREAS, the *Sweet-Bread*, is a large *Tab.* xiii. C.
land of the Salivary-kind, lying a-croſs the per and back-part of the *Abdomen*, along-ſide e *Duodenum* ; it is what the Antients call'd a onglomerate Gland, it appearing ſo (without iſſection) to the naked Eye ; it has a ſhort xcretory Duct, not more than half ſo large as Crow-quill, tho' it is commonly painted as rge as the *Ductus communis Choledocus*, and on the ſurface of this Gland, tho' it lies in e middle of it, it always enters the *Duodenum* gether with the Bile Duct : But in Dogs ſome ſtance from it, and, I think, always in two Ducts ſtant from one another. The Juice of this and, together with the Bile, ſerves to atte-ate the fluid Part of the digeſted Ali-ent, and render it fit to enter the Lacteals.

The SPLENE, is ſeated in the left *Hypo-* *Tab.* xiii. D.
ndrium, immediately under the *Diaphragm*, d above the Kidney, between the Stomach d the Ribs ; it is ſupported by the ſub-con-n'd Parts, and fix'd to its Place by an adheſi-

on to the *Peritoneum*; it is alſo connected to the *Omentum*, as has been obſerv'd. The Figure of it is a ſort of depreſs'd Oval, near twice as long as broad, and almoſt twice as broad as thick: Sometimes it is divided into Lobules, but for the moſt part, has only one or two ſmall Fiſſures on its Edge, and ſometimes none; in its Colour it reſembles Caſt-Iron. The inner Texture is Veſicular, like the *Penis*; in which Veſicles are found Grumous Blood, and ſmall Bodies, which, I believe, are rightly judg'd to be Glands: Now if the Coats of theſe Veſicles and Glandular appearances make half the Splene, and if the ſquare of a Section, of the Splene Perpendicular to the Courſe of the Blood, in the Splene, is any where Three Hundred times greater than the Squares of the like Sections of the Cavities of the Splenick Arteries, and Veins; and if the Square of the Section of the Vein is twice that of the Artery, then the Blood moves a Hundred and Fifty times ſlower in the Splene, than it does in the Artery and Vein, (they going in and out at the ſame Place) or a Hundred times ſlower than it does in the Artery, and Fifty times ſlower than it does in the Vein. I believe theſe are not the exact Proportions, nor can they be exactly found, though without doubt they may much nearer than theſe, which are made in a great meaſure by Gueſs; but they ſufficiently ſhow the Mechaniſm of this Part, which is ſingular and wonderful, and without doubt contriv'd for great Ends; tho' what they are we have not yet been ſo happy as to be certain of; but it has given Occaſion to Two ingenious *Hypotheſes*, one of my Honoured Friends, Sir *Richard Blackmore*, M.D. (whom it would be Vanity in me to commend) and the other of Dr. *Keill's*.

I know no way of computing with any exactneſs, the quantity of Bile that is uſually ſecreted by the Liver in a given time; but if it is Four times as much as all the *Salivary* Glands Secrete, it cannot be leſs than Twenty Four Ounces for every Meal; to which being added Six Ounces of *Saliva*, which, from what I have obſerv'd in the Chapter of the *Salivary Glands*, I think will appear a very moderate Computation; And ſuppoſing the *Pancreas* in the ſame time ſecretes Three Ounces, there will then be Thirty Three Ounces of Fluids ſeparated for the digeſtion of one Meal; and that theſe neceſſary Fluids may not be waſted in ſuch quantities, they paſs into the Blood with the Chyle, and may be ſoon ſeparated again for the ſame uſe; and very likely, ſome of the ſame Bile may be employ'd more then once, for digeſting Part of the ſame Meal: And as the Liver exceeds all the Glands in the Body in Magnitude, and its excretory Ducts ending in the *Duodenum*, it ſeems to me to be much more capable of making thoſe large ſeparations from the Blood, which are procured by Catharticks, than the *ſcarce* viſible Glands of the Guts.

The LIVER, ordinarily weighs, in a middle-ſiz'd Man, about Three Pounds Twelve Ounces, the *Pancreas* Three Ounces, and the Splene Fourteen Ounces. The *Splene* I have taken out of a Dog, without any remarkable inconvenience to him. And I have twice, in a Humane Body, ſeen Three Splenes, twice Two, and once Four; ſome of theſe were very ſmall, others nearly equal, but altogether in any of theſe bodies, were not greater than the one which is uſually found. I have ſeen a diſeas'd Liver in a Man, that weigh'd Fourteen Pounds, Four Ounces: And in a Boy but Nine Years old, that dy'd Hydropick, I found the Liver full of *Hydatids*, and Cyſts of *Hydatids* adhering to it, which together weigh'd Seven Pounds, One Ounce and a Half, tho' ſeveral Pints of Water had been let out of it before. The Splene, in the ſame Boy, together with the *Hydatids* contain'd in its Membrane, weigh'd Three Pounds: In a Man I found a diſeas'd Splene, weighing Five Pounds, Two Ounces; and in an old Man Six Foot high, I found a found Liver, weighing no more than Twenty-eight Ounces, and the Splene but Ten Ounces: and in a Man that was Cured of a Dropſy, I found a *Polypus* very ſolid, almoſt filling the large Branches of the *Porta* in the Liver, and a Stone between the Liver and Gall-Bladder, larger then a Nutmeg, and in a Man that dy'd of a Jaundice, I found the *Ductus communis Choledocus*, conſtricted by

Schirous *Pancreas*, the Gall-Bladder extended o the ſize of a Gooſe-Egg, and all the Ducts to wice their natural bigneſs. This is the Caſe n which I thought I had ſo plainly ſeen the *Cyibepatick* Ducts; I once ſaw the *Ductus Cyſticus* bſtructed without the Gall-Bladder, being diſended ſo much as is uſual, which, I think, furiſhes us with a very probable Argument againſt he exiſtence of *Cyſtibepatick* Ducts.

CHAP. VI.

Of the VASA LACTEA.

VASA LACTEA, are the *Venæ Lacteæ*, *Receptaculum Chyli* and *Ductus Thoicus.*

VENÆ LACTEÆ, *&c.* are a vaſt number f very fine pellucid Tubes, beginning from the nall Guts, and proceeding thence thro' the Ieſentery; they frequently unite, and form wer and larger Veſſels, which firſt paſs thro' ie Meſenterick Glands, and then into the *Reptaculum Chyli*; theſe Veſſels e'er they arrive : the Meſenterick Glands, (or in Dogs the *Panreas Aſſellii*, which is theſe Glands collected) e call'd *Venæ Lacteæ, primi generis*; and ience to their entrance into the *Receptacum Chyli, Venæ Lacteæ, ſecundi generis.* The ffice of theſe Veins, is to receive the Fluid irt of the digeſted Aliment, which is called

Chyle, and convey it to the *Receptaculum Chyli*, that it may be thence carry'd thro' the *Ductus Thoracicus* into the Blood-Veſſels.

RECEPTACULUM CHYLI, is a Ciſt of irregular Make, into which the *Venæ Lacteæ* empty the Chyle; it is ſeated between the Diaphragm and Emulgent-Veſſels, on the left ſide of the firſt and ſecond Lumbal *Vertebræ*.

DUCTUS THORACICUS, is a delicate pellucid Tube, large as a Swans-Quill, beginning from the *Receptaculum Chyli*, and ending in the left Subclavian-Vein. This Duct as it aſcends thro' the *Thorax*, firſt paſſes on the left ſide of the great Artery under the Beginnings of the *Intercoſtals*, and about the middle of the *Thorax*, divides for the ſpace of Three or Four Inches, and uniting again, runs on the ſide of the *Pharynx* into the left Subclavian-Vein. It has many Valves at unequal diſtances, (more in Men than Brutes) to prevent the regreſs of the Fluid it contains, and One very large Valve there is in the Subclavian-Vein to cover its entrance. Now ſuppoſing there ordinarily paſſes Five Pounds of Chyle, in a Natural day, through the Lacteals, and that Five Ounces of this only is added to the Blood, (though it may be any other quantity for ought I know) and that a Man neither decreaſes nor encreaſes during this time, then all the ſeparations from the Fluids and Solids muſt be juſt Five Pounds; Five Ounces of which muſt be thoſe Fluids and

Particles of Solids, which are become unprofitable; and the remaining Four Pounds Eleven Ounces, will ſerve as a Vehicle to carry the Five Ounces off: So that we ſee for what Reaſon more Fluids are carried into the Blood than are to be retain'd there, and how the Body is by the ſame means both Nouriſh'd and and Preſerv'd.

The Chyle is diluted in its paſſage by the Lymph. *Vid.* Chap. *Of the Lymphaticks.*

CHAP. VII.

Of the MEDIASTINUM, PLEURA, LUNGS, PERICARDIUM, *and* HEART.

PLEURA is a fine Membrane which lines the whole Cavity of the *Thorax*, except on the *Diaphragm*, which is cover'd with no other than its own proper Membrane; the back part of it is extended over the great Veſſels, like the *Peritoneum*; and in regard this Membrane paſſes partly under theſe Veſſels, as the *Peritoneum* does, in the *Abdomen*, they may be ſaid to lie in a duplicature of it; it ſerves to make the inſide of the *Thorax* ſmooth and equal.

MEDIASTINUM, is a Membrane that divides the *Thorax* lengthways, from the *Sternum* to the *Pericardium* and *Pleura*, which is a very ſhort ſpace, but in many Brutes very conſiderable. This Membrane may be eaſily divided into Two, in fat Men, but in Brutes it is always ſingle; it is ſo diſpos'd, that the Two Cavities into which it divides the *Thorax*, do not end toward this Membrane in an Angle, but a ſegment of a Circle; it hinders one Lobe of the Lungs, from incommoding the other, as in lying on one ſide, the uppermoſt would frequently do; and prevents the Diſorders of one Lobe of the Lungs from affecting the other.

Tab. xii. 2. The LUNGS, are compos'd of Two Lobes, One ſeated on each ſide of the *Mediaſtinum*, each of which Lobes are ſub-divided into Two or Three Lobules, which are moſt diſtinctly divided in ſuch Animals as have moſt Motion in their Backs, for the ſame end that the Liver is in the ſame Animals; they are each Compos'd of very ſmall Cells, which are the Extremities of the *Aſpera Arteria* or *Bronchos*. The Figure of theſe Cells is irregular; yet the ſides of 'em are exactly fitted to each other, ſo as to have common ſides, and leave no void ſpace: Dr. *Willis* has given a very particular deſcription of the inner Texture of the Lungs, but it is wholly imaginary and falſe, as he, and they who have Copied his Cuts and Deſcriptions could not but have known, if they had ever made the leaſt enquiry into the Lungs of any Animal; nor is his account of the Lymphaticks on the ſurface of the Lungs, at all more true than that of their Texture: In the Membranes of theſe Cells are diſtributed the Branches of the Pulmona-

Artery and Vein. The known uſes of the Airs en-
ring the Lungs, are to be inſtrumental in Speech,
d to convey *Effluvia* into the Noſe, as it paſſes,
the Senſe of Smelling; but the great uſe of it
which Life is preſerv'd, I think, we do not under-
nd; by ſome the force of the Air is thought to
parate the *Globuli* of the Blood, that have coher'd
the ſlow Circulation through the Veins, and
s Opinion ſeems to be favoured by the many
tances of *Polypuſſes* (which are large Concre-
ns of the *Globuli* of the Blood) found in the
ins near the Heart, and in the right Auricle
d Ventricle of the Heart, and their being
ſeldom found in the Pulmonary Veins, or in
left Auricle or Ventricle of the Heart, or in
y of the Arteries; but if it is true that while
Blood paſſes thro' the Lungs, many cohering
obuli are ſeparated, yet it remains to be
ov'd that theſe Seperations are made by the
ce of the Air: Dr. *Keill* has computed the
ce of the Air in Exſpiration againſt the
es of all the Veſicles, to be equal to Fifty
ouſand Pound Weight, yet if we conſider we
ll ſtill find the Moment of the Air in the
ngs exceeding ſmall in any ſmall ſpace. For
Velocity with which the Air moves in the
ngs, is as much leſs than that with which
moves in the Wind-Pipe, as the Square of a
tion of the Cells in the Lungs is greater
n the ſquare of a Section of the Wind-Pipe;
therefore if the ſquare of all the extreme Blood
Veſſels

Veſſels in the Lungs, do not bear a greater proportion to the ſquare of the large Pulmonary Veſſel than the ſquare of the Cells do to the Wind-Pipe and if the Blood in theſe large Veſſels move as faſt as the Air in the Wind-Pipe; all which I think may be eaſily granted, then the Bloo moving in the ſmalleſt Veſſels of the Lungs wit a Velocity equal to that of the Air in the Cells, th Blood will have as much more preſſure from th Power that moves it in its own Veſſels than the Ai can give upon them, as Blood is heavier than Air Beſides, we muſt conſider that Air preſſing equal ly to all Sides, and the *Globuli* of the Blood ſwimming in a Fluid; this preſſure, be it what it will I think, can be of little uſe to make ſuch ſeparations: Others have thought that the Air enters th Blood Veſſels from the Cells in the Lungs, an mixes with the Blood; but this Opinion, tho very probable, wants ſufficient Experiments t prove it, Air being found in the Blood, as there certainly is, is no Proof of its entering this way, becauſe it may enter with the Chyle; nor is the impoſſibility which has been urg'd of its entering at the Lungs without the Blood being liable to come out the ſame way into the Veſſicles of the Lungs, a good Argument to the contrary; for if a pliable Duct paſſes between the Membranes of a Veſſel, thro' a ſpace greater than the ſquare of its Orifice, no Fluid can return, becauſe the preſſure which ſhould force it back will be greater againſt the ſides of

that Duct than its Orifice; which is the
aſe of the Bile Duct entering the *Duodenum*,and
e Ureters entering the Bladder. I think the
ſt Arguments for the Airs entering into the
lood by the Lungs, or rather ſome particular
rt of the Air, may be fetch'd from what the
earned Dr. *Halley* obſerv'd in a Diving Bell,
a Mans wanting near a Gallon of freſh Air
a Minute, for if nothing but preſſure had been
anted from the Air in the Lungs, he had near thrice
much preſſure without any ſupply of freſh Air,
a Man hath upon the ſurface of the
lobe; and Animals dying ſo ſoon in Air that
s been burnt, and their being ſo eaſily intox-
ated by breathing Air much impregnated with
e *Effluvia* of Wine or Brandy, are alſo, in my
pinion Arguments, of a paſſage this way into
e Blood: Beſides, if preſſure of the Air in
e Cells of the Lungs is the only uſe of it, I do
t ſee but enough of that may be had while a
an is Hanging, if the Muſcles of the *Thorax*
but Act upon the Air which was left in the *Tho-*
x, when the Rope was firſt fix'd,and yet Death
brought about by Hanging no other way than
interrupting of the Breath, as I have found
certain Experiments. Dr. *Drake* has endea-
our'd to ſhow, that the uſe of Reſpiration is
aſſiſt the Syſtole of the Heart, but this uſe
quires that the Syſtole and Diaſtole of the
eart, ſhould keep time with Expiration and
nſpiration, which is contrary to experience:
Beſides,

Beſides, if his *Hypotheſis* was true, it could only ſerve the right Ventricle of the Heart. The Lungs of Animals before they have been dilated with Air, are ſpecifically heavier than Water, but upon inflation they become ſpecifically lighter and ſwim in Water; which experiment may be made to diſcover whether a Dead Child, was Still Born or not; but if the Child has Breath'd but a little, and the experiment is made long after, the Lungs may be Collaps'd, and grow heavier than Water, as I have experimented, which may lead a Man to give a wrong Judgment in a Court of *Judicature*; but then it will be on the Charitable ſide of the Queſtion.

Adheſions of the Lungs to the *Pleura* are ſo common, I know not how to call it a Diſeaſe; they being found ſo more or leſs in all adult Perſons, and without any inconvenience, if the Lungs are not rotten.

xii. j. PERICARDIUM or HEART-PURSE, is an exceeding ſtrong Membrane which covers the Heart; its ſide next the great Veſſels is partly connected to them, and partly to the Baſis of the Heart; but, I think, not at all perforated by thoſe Veſſels, and its lower ſide is inſeparable from the Tendinous part of the Diaphragm, but not ſo in Brutes. It encloſes all the Heart except its Baſis; its uſes are to keep the Heart in its place, without interrupting its Office, to keep it from having any Friction with the Lungs, and to contain a Liquor to lubricate the ſurface of

the

eHeart,and abate itsFrictionagainſt the *Pericar-*
um,andto contain a quantityofLymphſufficient
r lubricating the external Fibres of the Heart.
The HEART, is a Muſcle of a Conick Fi-
ire, with Two Cavities or Ventricles; its Ba-
is fix'd by the Veſſels going to and from it,
on the fourth and fifth *Vertebræ* of the *Tho-*
x, and its *Apex*, or Point is inclin'd, down-
ard and to the left ſide, where it is receiv'd
a Cavity of the left Lobe of the Lungs, as
ay be obſerv'd the Lungs being extended with
ir: This Incumbrance on the left Lobe of the
ings, I imagine is the Cauſe of that Sides
ing moſt ſubject to Pluritick Pains.
At the Baſis of the Heart, on each ſide, are ſi-
ated the Two Auricles to receive the Blood;
e right from the Two Cava's, and the left
m the Pulmonary-Veins: In the right, at the
eeting of the Cava's, is an Eminence call'd
berculum Loweri, which is partly rais'd by the
cumbent Pulmonary Artery and Vein. Its
e is to prevent the Blood in both theſe Veſ-
s from obſtructing each other, and to direct
Courſe of the Blood in both of 'em into the
tricle; immediately below this Tubercle, in
ending of the *Cava aſcendens*, is the *veſtigi-*
of the *Foramen Ovale*; (*Vid.* Chap. *Of the*
tus) and near this, in the Auricle, is the
uth of the Coronary-Veins. The left Auri-
is abundantly leſs than the right; but the
fference is ſupply'd by a large Muſcular Cavi-

ty, which the Two Veins from the Lungs afford in that place; the ſides of this Muſcular Cavity are thicker than the ſides of the right Auricle, in about that Proportion in which the left Ventricle of the Heart is ſtronger than the right; their uſes being to receive Blood from the Veins, that lead to the Heart, and preſs it into the Ventricles; a ſtrength in each Auricle proportionable to the ſtrength of the Ventricle that it is to fill with Blood, ſeems plainly neceſſary: And this different thickneſs of the Coats of the Auricles makes the Blood in the left, which is thickeſt, appear thro' it of a paler Red; but when it is let out of the Auricles it appears alike from both; which they would do well to examine, who affirm the Blood returns from the Lungs of a more florid Colour than it went in; and offer it as an Argument, of the Bloods being mix'd with Air in the Lungs: In both Auricles are Muſcular *Columnæ*, like thoſe in the Ventricles, but ſmaller.

The Ventricles or Cavities in the Heart which receive the Blood, are hollow Muſcles, or Two Cavities in one Muſcle, whoſe Fibres interſect one another, ſo as to make the preſſure of the Heart upon the Blood more effectual, and are alſo leſs liable to be ſeparated than they wou'd have been if they had lain parallel; both theſe Cavities are of the ſame bigneſs, tho' the left appears the ſmalleſt, and is often deſcrib'd ſo; but this happens from a greater Contracti-

on

n in the left than the right, in the Article of
eath, the left being abundantly thicker and
ronger, becauſe a greater force is requir'd to
ive the Blood through the whole Body, which
the Office of the left, than thro' the Lungs,
hich is the uſe of the right Ventricle. Over
e Entrance of the Auricles in each Ventricle,
e plac'd Valves to hinder a return of Blood
hile the Heart contracts. Thoſe in the right
entricle are nam'd *Tricuſpides*, thoſe in the
ft *Mitrales*. One of theſe ſeem to do further
rvice, by covering the Mouth of the *Aorta*
hile the Ventricle fills; which ſuffering none
the Blood to paſs out of this Ventricle into
e *Aorta* before the Ventricle Acts, it will be
le to give greater force to the Blood than it
herwiſe might have done, becauſe a greater
antity of Blood more fully diſtending the
entricle, and making the greater reſiſtance,
will be capable of receiving the greater im-
eſs'd force from the Ventricle. The inner
ibres of each Ventricle are diſpos'd into ſmall
ords, which are call'd *Columnæ*: From ſome
theſe ſtand ſmall portions of Fleſh call'd
pillæ; theſe *Papillæ* are ty'd to the Valves by
ender Fibres, whereby they keep the Valves
om being preſs'd into the Auricles, by the
ction of the Blood againſt them in the Syſtole
the Heart, and when that is over, the Blood
owing in between them opens them; as the
reſſure of Blood on the other ſide ſhut 'em in
the

the Syſtole. *For the Courſe of the Blood thro' this Part,* (*Vid.* Chap. *Of the Courſe of the Aliment and Fluids.*)

In the beginning of each Artery from the Heart, are plac'd Three Valves, which look forward, and cloſe together to hinder a regreſs of Blood into the Ventricles. Thoſe in the Pulmonary-Artery, are nam'd *Sigmoidales*, thoſe in the *Aorta*, *Semilunares.* *Canalis Arterioſus.* (*Vid.* Chap. *Of the Fœtus.*)

In a Boy I found a great quantity of *Pus* in the *Pericardium*, and the Baſis of the Heart Ulcerated. In Perſons that have dy'd of a Dropſy, I have always obſerv'd the Heart large, its Fibres lax, and the Veſſels about it immoderately diſtended, and Polypuſes ſometimes in both Auricles and Ventricles, and in the large Veins; but more frequently in the right Auricle and Ventricle. I diſſected a Man that dy'd Tabid, in whom the *Pericardium* univerſally adher'd to the Heart, and a portion of the Muſcular part of the Heart was Oſſify'd as large as a Six-pence. The beginning of the *Aorta*, has been frequently ſeen Oſſify'd, eſpecially in Aged Perſons. In a Woman that dy'd of a *Dropſie*, I found the Valves of the *Aorta* quite cover'd with Chalk Stones, which not ſuffering the Valves to do their Office, the left Ventricle of the Heart was conſtantly overcharged with Blood, and diſtended to above twice its Natural bigneſs which I immagine deſtroyed the Œconemy of the Body, and occaſioned the *Dropſie.*

CHAP.

CHAP. VIII.

Of the ARTERIES and VEINS.

FROM the right Ventricle of the Heart ariſes the Pulmonary Artery, which ſoon divides into Two Branches, One to each Lobe of the Lungs, and then they ſub-divide into ſmaller and ſmaller Branches, until they are diſtributed into every part of the Lungs. And rom the extreme Branches of the Pulmonary Artery, ariſe the ſmall Branches of the Pulmonary Veins, which as they approach the left Auricle of the Heart, unite in ſuch a manner s the Pulmonary Artery divides going from he Heart, only that the Veins enter the Muſcular Appendix of the Left Auricle in ſeveral Branches, and the Blood being brought back from he Lungs by theſe Veſſels to the Left Auricle, nd Ventricle of the Heart, it is from the Left Ventricle of the Heart thrown into the *Aorta*.

AORTA, or GREAT ARTERY, ariſes rom the Left Ventricle of the Heart, and deals ut Branches to every part of the Body. The irſt Trunk of this Veſſel, is call'd *Aorta aſcendens*; it paſſes over the left Pulmonary Artery, nd Veins and Branch of the *Aſpera Arteria*; nd being reflected under the left Lobe of the Lungs, it commences *Aorta deſcendens*, which

Name it keeps thro' the *Thorax* and *Abdomen* where it deſcends on the left ſide of the Spine, till its diviſion into the Iliac Arteries between the third and fourth *Vertebræ* of the Loyns.

From under Two of the Semilunar Valves of the *Aorta*, which is e'er it leaves the Heart, ariſe Two Branches (ſometimes but One) which are beſtow'd upon the Heart, and are call'd *Coronariæ Cordis.* From the curv'd part of the *Aorta*, which is about Two or Three Inches above the Heart, ariſe the Subclavian and Carotid Arteries, the right Subclavian and Carotid in One Trunk, but the left Single. By ſome Authors theſe Veſſels have been deſcrib'd in a different manner, but I believe their deſcriptions were for want of Humane Bodies taken from Brutes; for I have never yet ſeen any variety in theſe Veſſels in Humane Bodies, tho' I have in the Veins nearer the Heart; and indeed there ſeems to me to be a Mechanical neceſſity for their going off in the Manner here deſcrib'd in Humane Bodies; for the right Subclavian and Carotid Arteries neceſſarily going off from the *Aorta* at a much larger Angle than the left, the Blood wou'd move more freely into the left than the right, if the right did not go off in one Trunk, which gives leſs Friction to the Blood, than two Branches equal in Capacity to that one, ſo that the Advantage the left have by going off from the *Aorta*, at much acuter Angles than the right, is made up to the right by their going off at firſt in but one Branch.

The Carotid Arteries run on both ſides the *La-ynx* to the ſixth *Foramina* of the Scull, thro' vhich they enter to the Brain ; but as they paſs hro' the Neck, they detach Branches to every art about 'em, which Branches are call'd by he Names of the Parts they are beſtow'd upon ; s, *Laryngeæ*, *Thyroideæ*, *Pharyngeæ*, *Linguales*, *emporales*, *Occipitales*, *Faciales*, &c. but juſt efore they enter the ſixth *Foramina* of the Scull, hey each ſend a ſmall Branch thro' the fifth *oramina* of the Scull to that part of the *Dura ater* which contains the *Cerebrum.* It is theſe rteries which make thoſe impreſſions which re ſo conſtantly obſerv'd on the inſide of the *ſſa Bregmatis.* The Internal Carotids, ſend Two ranches to the Back part of the Noſe, and ſeveral ranches thro' the firſt and ſecond *Foramina* of ne Scull to the Face and parts contain'd within ne Orbits of the Eyes, and then piercing the *ura Mater*, they each divide into Two Bran-nes, one of which they ſend under the *Falx* the *Dura Mater*, between the Two Hemiſ-neres of the Brain, and the other between the nterior and Poſterior Lobes of the Brain. heſe Branches take a great many turns, and vide into very ſmall Branches in the *Pia Mater* efore they enter the Brain, as if large Trunks ou'd make by their Pulſe too violent an im-reſſion on ſo tender and delicate a Part. And rhaps it may be from an increaſe of the Im-ılſe of the Arteries in the Brain, which ſtrong

Liquors always produce, that the Nerves are ſo much interrupted in their uſes throughout the whole Body, when a Man is intoxicated with Drinking; and it may alſo be from a like Cauſe, that Men are ſo often delirious in violent Fevers. Beſides theſe Two Arteries, *viz.* the Carotids, the Brain has Two more, call'd *Cervicales*, which ariſe from the Subclavian Arteries, and aſcend to the Head thro' the *Foramina*, in the Tranſverſe Proceſſes of the Cervical *Vertebræ*, and into the Scull thro' the Tenth or great *Foramen*; theſe Two Arteries uniting ſoon after their entrance, they give off Branches to the *Cerebellum*, and then paſſing forward, divide and communicate with the Carotids; and the Carotid Arteries communicating with each other, there is an entire communication between them all; and theſe communicant Branches are ſo large, that every one of theſe Four great Veſſels, with all their Branches, may be fill'd with Wax injected thro' any One of them, as I have often Experienced.

The Subclavian Arteries, are each continu'd to the Cubit in one Trunk, which is call'd *Axillaris* as it paſſes the Arm-pits, and *Humeralis* as it paſſes by the inſide of the *Os Humeri*, between the Muſcles that bend and extend the Cubit. From the Subclavians within the Breaſt ariſe the *Arteriæ Mammariæ*, which run on the inſide of the *Sternum*, and lower than the *Cartilago Enſiformis*. As ſoon as the *Arteria Humeralis* has paſs'd the Joynt of the Cubit, it divides into

Two Branches, call'd *Cubitalis ſuperior* and *Cubitalis inferior*, which latter ſoon ſends off a Branch, call'd *Cubitalis media*, which is beſtow'd upon the Muſcles ſeated about the Cubit. The *Cubitalis Superior* paſſes near the *Radius*, and round the Root of the Thumb, and gives One Branch to the Back of the Hand, and Two to the Thumb, One to the firſt Finger, and a Branch to communicate with the *Cubitalis inferior.* The *Cubitalis Inferior* paſſes near the *Ulna* to the Palm of the Hand, where it takes a turn, and ſends One Branch to the out-ſide of the Little Finger, another between that and the next Finger, dividing to both, another in the ſame manner to the Two Middle-Fingers, and another to the Two Fore-Fingers. Theſe Branches, which are beſtow'd on the Fingers, run One on each ſide of each Finger internally to the Top, where they have ſmall Communications, and very often there is a Branch of Communication between the *Humeral* and *inferior Cubital* Arteries; this Communicant Branch is ſometimes very large, and liable to be Prick'd by careleſs or injudicious Blood-letters, in Bleeding in the Baſilic Vein, immediately under which, as far I have been able to obſerve, this Branch always lies: When the Operation for an *Aneuriſm* is made upon this Communicant Branch, it is neceſſary to Tie it on both ſides of the Orifice, becauſe the Blood is liable to flow freely into it either way.

From the deſcending *Aorta* on each ſide is ſent a Branch under every Rib, call'd *Intercoſtalis*, and about the fourth *Vertebra* of the Back, it ſends off Two Branches to the Lungs, call'd *Bronchiales*, which are ſometimes both given off from the *Aorta*, ſometimes one of them from the Intercoſtal of the fourth Rib on the right ſide; and as the *Aorta* paſſes under the Diaphragm, it ſends Two Branches into the Diaphragm, call'd *Arteriæ Phrenicæ*, which ſometimes riſe in one Trunk from the *Aorta*, and ſometimes from the *Cœliaca*; but oftner the right from the *Aorta*, and the left from the *Cœliac*. Immediately below the Diaphragm ariſes the *Cœliac* Artery from the *Aorta*, it ſoon divides into ſeveral Branches, which are beſtow'd upon the *Liver*, *Pancreas*, *Splene*, *Stomach*, *Omentum* and *Duodenum*. Theſe Branches are nam'd from the Parts they are beſtow'd on, except Two that are beſtow'd upon the Stomach, which are call'd *Coronaria ſuperior* and *inferior*, and the Branch beſtow'd upon the *Duodenum*, which is nam'd *Inteſtinalis*. At a very ſmall diſtance below the *Arteria Cœliaca* from the *Aorta*, ariſes the *Meſenterica ſuperior*, whoſe Branches are beſtow'd upon all the *Inteſtinum Jejunum* and *Ileum*, part of the *Colon*, and ſometimes one Branch upon the Liver. A little lower than the ſuperior Meſenteric Artery, ariſe the Emulgents, which are the Arteries of the Kidneys. And a little lower than the Emulgents, forward from the *Aorta*, ariſe the *Arte-*

riæ Spermaticæ. For which, *Vid.* Chap. *Of the Parts of Generation in Men.*

Lower laterally, the *Aorta* ſends Branches to the Loyns, call'd *Lumbales*, and one forward, to the lower part of the *Colon* and the *Rectum*, call'd *Meſenterica inferior.* Between the *Arteria Cœliaca Meſenterica ſuperior*, and *inferior* and the Branches of each, near the Guts, there are large communicant Branches to convey the Blood from one to another when they are either compreſs'd in any poſture, or ſtreighten'd by being ſtretch'd out in Ruptures, or from any other Cauſe.

As ſoon as the *Aorta* divides upon the Loins, it ſends off an Artery into the *Pelvis* upon the *Os Sacrum*, call'd *Arteria Sacra*, and the Branches the *Aorta* divides into, are call'd *Iliacæ*, which in about Two Inches ſpace divide into External and Internal. The *Iliacæ Internæ*, firſt ſend off the Umbilical Arteries which are dry'd up in adult Bodies, except at their Beginnings, which are kept open or the collateral Branches on each ſide, One to the Bladder, and One to the *Penis* in Men, and in Women the *Uterus*; the reſt of theſe Trunks are beſtow'd upon the Buttocks, and upper parts of the Thighs. The *Iliacæ Externæ*, run over the *Oſſa Pubis* into the Thighs; and as they paſs out of the *Abdomen*, they ſend off Branches, call'd *Epigaſtricæ*, to the fore-part of the Integuments of the *Abdomen* under the *Recti* Muſcles. And the Epigaſtrick Arteries ſend each a Branch into the *Pelvis* and thro' the *Foramina* of the *Oſſa Innominata*

nominata to the Muſcles thereabouts. As ſoon as the Iliac Artery is paſs'd out of the *Abdomen* into the Groin, it is call'd *Inguinalis*, and in the Thigh *Cruralis*, where it ſends a large Branch to the back-part of the Thigh; but the great Trunk is continu'd internally between the Flexors and Extenſors of the Thigh, and paſſing thro' the Inſertion of the *Triceps* Muſcle into the Ham, it is there call'd *Poplitea*; then below the Joynt it divides into Two Branches, One of which is call'd *Tibialis antica*, it paſſes between the *Tibia* and *Fibula* to the fore-part of the Leg, and is beſtow'd upon the Great Toe, and One Branch to the next Toe to the Great One, and another between theſe Toes to Communicate with the *Tibialis poſtica*; which Artery ſoon after it is divided from the *Antica*, ſends off the *Tibialis media*, which is beſtow'd upon the Muſcles of the Leg, while the *Tibialis poſtica* goes to the bottom of the Foot and all the leſſer Toes. The *Tibialis antica*, is diſpos'd like the *Cubitalis ſuperior*; the *Poſtica*, like the *Cubitalis inferior*; and the *Media* in each, have alſo like uſes. Theſe Arteries which I have deſcrib'd, are uniform in moſt Bodies, but the leſſer Branches are diſtributed like the Branches of Trees in ſo different a manner one Body from another, that it is highly probable there are not any Two Bodys alike, nor the Two ſides in any one Body; wherefore I think it is not needful to deſcribe any of them.

I have once ſeen a Rupture of Matter, and once f Blood and Matter, which flow'd out of the *Abdomen* into the Fore-part of the Thigh, through he ſame Paſſage at which the Iliac Artery goes ut of the Abdomen.

The VEINS ariſe from the Extremities of the Arteries, and make up Trunks which accompany he Arteries in almoſt every part of the Body, nd have the ſame Names in the ſeveral Places which the Arteries have, which they accompany. The Veins of the Brain unload themſelves into he Sinuſes, (*Vid.* Chap. *Of the Dura and Pia Mater*) and the Sinuſes into the internal Jugulars nd Cervicals, and the internal Jugulars and Cervicals into the Subclavians, which joyning, make the *Cava deſcendens*. The Internal Jugulars are ſeated y the Carotid Arteries, and receive the Blood rom all the Parts which the Carotids ſerve, except the Hairy-ſcalp and part of the Neck, whoſe Veins enter into the External Jugulars, which run immediately under the *Muſculus Quadratus Genæ*, often Two on each ſide. The Cervical Veins, deſcend Two thro' the *Foramina* n the Tranſverſe Proceſſes of the *Cervical Vertebræ*, and Two thro' the great *Foramen* of the pine, and One on each ſide the Spinal Marrow; heſe joyn at the loweſt *Vertebra* of the Neck, nd then empty into the Subclavians, and at the nterſtices of all the *Vertebræ* communicate with one another.

The Veins of the Arm are more than double he Number of the Arteries, there being one on each ſide each Artery, even to the ſmalleſt Branches that we can trace, beſides the Veins which run immediately under the Skin. Thoſe which accompany the Arteries have the ſame Names with the Arteries; thoſe which run immediately under the Skin on the back of the Hand have no proper Names, they run from thence to the inſide of the Elbow; where the uppermoſt is call'd *Cephalica*, the next *Mediana*, the next *Baſilica*, and the loweſt *Salvatella.* Theſe all communicate near the Joynt of the Elbow, and then ſend One Branch which is more directly from the *Cephalica*, and bears that Name, until it enters the Subclacian Vein; it paſſes immediately under the Skin, in moſt Bodies, between the Flexors and Extenſors of the Cubit, on the upper ſide of the Arm. The other Branches joyning, and receiving thoſe which accompany the Arteries of the Cubit, they paſs with them by the Artery of the Arm into the Subclavian Vein. The External Veins have frequent communications with the Internal, and are always fulleſt when we uſe the moſt Exerciſe, becauſe the Blood being expanded by the Heat which Exerciſe produces, it requires the Veſſels to be diſtended, and the inner Veſſels, being compreſs'd by the Actions of the Muſcles, they cannot dilate enough, but theſe Veſſels being ſeated on the out-ſides of the Muſcles, are capable of being much dilated; and this ſeems to me to be the chief uſe of theſe External Veſſels. The *Cephalic* Vein as it runs up the Arm, is very Viſible in moſt Men, but in Children is rarely to be ſeen; therefore great care ſhould be taken not to Wound it in the Cutting of Iſſues in Childrens Arms; and I know no way to be ſure of avoiding it, but by cutting the Iſſue more Externally than is uſual in Men, which may be done without any inconvenience.

In the *Thorax*, beſides the Two *Cava's*, there is a Vein call'd *Azygos* or *Vena ſine Pari*, it is made up of the Intercoſtal, Phrenic, and Bronchial Veins, and enters the deſcending *Cava* near the Auricle, as if its uſe was to divert the deſcending Blood from falling too directly upon the Blood in the aſcending *Cava*, and direct the Blood of the deſcending *Cava* into the Auricle; beſides this Vein in the *Thorax*, are the Mammary Veins, one to each Artery; and the Veins of the Heart which are call'd *Coronariæ*; they are twice the Number of the Arteries, but they enter the Right Auricle at only one Orifice.

In the *Abdomen*, (beſides the *Cava aſcendens*, and the Veins which are nam'd like the Arteries, *viz.* The *Emulgents* from the Kidneys, the *Lumbal* and *Spermatick* Veins, the *Sacra*, *Iliac* and *Hypogaſtrick* Veins) there is One large one call'd *Vena Portæ*, which ariſes from all the Branches of the Cœliac and Two Meſenterick Arteries, and uniting in one Trunk enters the Liver, and is there again diſtributed like an Artery, and has its Blood collected and brought into the *Cava* by the Branches of the *Cava* in the Liver; this Vein being made uſe of inſtead of an Artery, to carry Blood to the Liver, for the ſeparation of Bile. NATURE has procured a Circulation of Blood about Eight times ſlower than it is in the Arteries hereabouts; and this ſlow Circulation being ſuppos'd neceſſary, I think, there could be no other ſo fit way of procuring it; for if an Artery had been employ'd for this Uſe, and been thus much dilated in ſo ſhort a paſſage, the Blood would not have mov'd uniformly in it, but much faſter thro' its Axis than near its ſides; and beſides, it is very probable that the Blood in this Vein, having been firſt employ'd in Nouriſhing ſeveral parts, and having thro' a long ſpace moved ſlowly, may be made much fitter for the ſeparation of Bile than Blood carried by an Artery, dilated to procure a Circulation of the ſame Velocity with that in this Vein.

In the Leg the Veins accompany the Arteries in the ſame manner as in the Arm, the External Veins of the Foot being on the upper ſide, and from them is deriv'd One call'd *Saphœna*, which is continu'd on the inſide of the Limb it's whole length, and has ſeveral Names given it from the ſeveral Places thro' which it paſſes.

The Arteries are ſaid to have Three Coats, a middle Muſcular, and an external and internal Membranous. The Veins are ſaid to have the ſame; the internal Coat of an Artery may be pretty eaſily ſeperated, but not the External; and tho' the Veins have certainly Muſcular Fibres, yet I could never ſeparate any one diſtinctly into

three

hree Coats; and in the inſide of the Veins their re many Valves, eſpecially in the lower Limbs, o hinder any reflux of the Venal Blood, which therwiſe would have happened from the frequent Actions of the Muſcles on the outſides of the Veins; and both the Arteries and Veins as they un in the inſide of a Limb, or as they are diſperſed in Parts that ſuffer great Extenſions as the Stonach, Guts and *Uterus*, they are bent in and out o much as that when theſe Parts come to be diſended, they may comply with thoſe diſtentions, y only being ſtreigtened, and ſo preſerved from eing ſtretched, which would leſſen their Diameers. The ſmall Arteries near the Heart go off from he large Trunks at obtuſe Angles, farther at eſs obtuſe Angles, then at Right Angles, farther till at acute Angles, and near the extremities at very acute Angles, becauſe the Blood in the Veſſels ar from the Heart moving with leſs Velocity than he Blood in the Veſſels near the Heart, the Blood n the Collateral Branches more remote from the Heart wants the advantage of a directer courſe; nd becauſe a very large Branch ariſing out of anoher, might weaken too much the ſides of the Veſſel it would ariſe from. NATURE has aken care to prevent any ſuch Miſchief by encreaſing the Number, and ſo leſſening the Size f the Collateral Branches, where otherwiſe one arge Branch would have ſerv'd better; as in the going off of the Subclavian and Carotid Arteries, which might have gone off for ſome ſpace in one

Trunk; but this Mechaniſm is more evident in the going off of the *Arteria Cœliaca* and *Meſenterica ſuperior.* And the ſmall Arteries always divide ſo as that the leaſt Branches may lie leaſt in the direction of the Blood flowing into them, which makes the Blood flow moſt Freely into thoſe Branches, that have fartheſt to carry it; and the ſmaller Branches ariſe more or leſs obliquely, from the ſides of other Arteries, according to the proportion they bear to the Arteries they ariſe from, becauſe an Artery comparatively large ariſing obliquely from the ſide of another, would make an Orifice, in that it ariſes from too large and weaken it. And both theſe ends are at once brought about, by making the Arteries that give off the Branches, bend more or leſs towards the Branches they give off, according to the comparative magnitude of the Branches given off.

Borelli has computed the force which the Heart exerts at every *Syſtole*, to be equal to Three Thouſand Pounds Weight, and the force which all the Arteries exert at every *Syſtole*, to be equal to Sixteen Thouſand Pounds Weight, and that they together overcome a force equal to a Hundred and Thirty Six Thouſands Pounds Weight; and Dr. *Keill* has computed that the Heart in every *Syſtole*, exerts a force not exceeding Eight Ounces, (but in both theſe accounts a Weight in Motion is compared to a Weight at Reſt) the firſt of them was made by compareing the Heart with other Muſcles, whoſe Power to ſuſtain a Weight could be beſt determin'd, and the later computation was made from the Velocity of the Blood moving in an Artery, therefore if we conſider that *Borelli*'s way of computing led him to find out the abſolute force of the Heart, and Dr. *Keill*'s the force which the Heart uſually exerts; perhaps theſe very different Computations may in ſome meaſure be accounted for, for if the force of the Heart, which is conſtantly exerted, ſhould compar'd with any other Muſcle, be but in a reciprocal proportion of the frequency of their Actions, and the importance of their uſes; may not the Heart very fitly have a force vaſtly greater than uſually it exerts, becauſe it is always in Action, and muſt be able to exert a certain force in the loweſt ſtate of Health. What force the Heart ever exerts in a grown Man, I cannot ſay, but it muſt be leſs in each Ventricle than s ſufficient to burſt the Valves, which hinder the Blood from returning into the Auricles out of the Ventricles, or than is ſufficient to break thoſe tender Threads by which theſe Valves are Tyed to the *Papillæ*. In a Dog I found the force which the Heart would exert, would not raiſe to One Foot Perpendicular Height, a Column of Blood through the *Aorta aſcendens*. And when inject the Arteries of a Child, I find a force exceeding little, will throw Water through all the Veſſels, with a Velocity equal to that with which the Blood moves in thoſe Veſſels when living. And f the Heart like other Muſcles can perform the firſt part of its contraction with moſt eaſe, is not the quick Actions of the Heart in Fevers owing to its not being able to empty the Ventricles every Syſtole, which I think will oblige it to act *Cœteris Paribus* ſo much the oftner. Here I will obſerve, not having conſider'd it in the proper Place, that though the Auricles of the Heart are equal to each other, and the Two Ventricles alſo equal, yet the Auricles are not ſo large as the Ventricles; for the Ventricles contain not only all the Blood which Flow'd from the Veins into the Auricles, during the Contraction of the Heart, but alſo that which Flows (which will be directly into the Heart) while the Auricles contract, and the Ventricles dilate; which leads us to the exact knowledge of the uſe of the Auricles. If the Syſtole and Diaſtole of the Heart are performed in equal times, then the Auricles muſt be half the Size of the Ventricles; or whatever proportion the ſpace of time of the Syſtole of the Heart, bears to the ſpace of time in which the Syſtole and *Diaſtole* are both perform'd, that proportion will the Cavities of the Auricles bear to the Cavities of the Ventricles.

If the Arteries contract about a Fourth part of the Squares of their Diameters at every Syſtole, and if the Heart does not throw out a quantity at every Syſtole, equal to the Fourth part of the Solid Contents of all the Arteries when dilated, it is evident the Heart does not throw the Blood through the whole Arterial Syſtem, but into ſo much of the Arteries naereſt the Heart, as will contain Four times as much as is thrown out of the left Ventricle at once, and then this Portion of Arteries throws the Blood forwards and dilates the Arteries that lie next; and ſo on; but the Sections of all the remoter Veſſels, being greater than a Section of the *Aorta*, the Blood will move ſo much lower in the leſſer Veſſels than in the greater, as the Sections of the leſſer Veſſels are greater than the Section of the greater Veſſel or Veſſels. The ſtrength of the Coats of the Arteries if the Blood preſs'd equally againſt the ſides of them all, ought to be one to another as their Circumferences, becauſe ſo much as the Circumference of one Artery is greater than another, ſo much greater preſſure its Sides muſt ſuſtain; but the Arteries neareſt the Heart, ſuſtaining the reaction of all the Arterial Blood, they muſt have a Strength ſomewhat greater than in that proportion: And the Veſſels, both Arteries and Veins, the more diſtant they are from the Head, the greater proportional Strength their Coats muſt have, becauſe the Arterial and Venal Blood communicating, they will preſs upon the lower Veſſels, with a force proportional to the perpendicular Altitude of Blood above, which will be that of the perpendicular Altitude of the whole Body; for tho' the Aſcending Blood of the Arteries, may be ſaid not to preſs upon the deſcending because it moves another way, nevertheleſs it being thrown from the Heart into one common Veſſel, which afterwards divides the Blood moving both ways Communicates, and that force which is neceſſary to overcome the natural inclination of the aſcending Blood to deſcend, will be impreſs'd alſo upon the deſcending Blood, which is juſt the ſame with the Weight of the aſcending Blood, and the Veins both from above and below communicating at the right Auricle, the preſſure in them will alſo be as the Perpendicular Altitude of the Body; ſo that the Blood in all the Veins and Arteries reſembles a Fluid in a curv'd Tube, in which that Part in one Leg, exactly Ballances that in the other, both preſſing moſt upon thoſe parts which are neareſt the Center of the Earth: Accordingly we find by experience, that Humours are moſt apt to flow to the loweſt parts, and that by laying thoſe parts upon a level with the whole Body, this inconvenience is remedied, but laying a Leg only in a Chair does it but in part, juſt ſo much as the pendicular Altitude of the Body from that part, is ſhortned. There is alſo to be conſider'd concerning the thickneſs of the Coats of the Veſſels, that the Blood moving ſlower in the ſmall Veſſels than in the great, the Moment of the Blood againſt the Sides of a ſmall Veſſel, will be as much leſs than the Moment of the Blood againſt equal Parts of a great one, as the velocity of the Blood in a ſmall Veſſel is leſs than that in a great one, and therefore their Coats may alſo differ from the former proportion, as the Velocity of the Blood differs. Nevertheleſs

the

vhenever any of the minuteſt Arteries are obſtruct-
d ſo as to occaſion the burſting of any Veſſel, they
re deriv'd from, it will be that Veſſel that is
eareſt to thoſe Obſtructions, becauſe the Coats
f that Veſſel are weaker than any other nearer
he Heart. And if Hæmorrhages of Blood do fre-
uently ariſe from Obſtructions in the minuteſt
eſſels, it plainly appears, how Opium and the
ark, which moſt powerfully thin the Blood come
o be ſo often effectual Remedies in that Caſe. And
he Coats of the leſſer Veſſels being proportiona-
lly weaker than the great ones, according to the

decreaſe of the Velocity of the Blood, which leſſens the moment with which it moves in them, whenever the Blood begins to move in them with an equal Velocity, or greater as it happens after an amputation when the great Veſſels are tied, the Force of Blood often overcomes the ſtrength of the Coats of the ſmaller Veſſels, and dilates them ſo, that ſometimes thoſe Veſſels, which ſcarce Bled during the Operation, will in a few Hours bleed vehemently; and this conſtant effort of the Blood to dilate Veſſels upon the Obſtructions of others, I take to be one Reaſon of thoſe throbbing Pains which are felt in Wounds when the bleeding is ſtop'd, and in all violent Inflamations until the Collateral Branches are dilated.

The Extream Branches both of the Arteries and Veins have very numerous Communications, like thoſe in the *Stamina* of the Leaves of Plants, by which Communications the Blood that is obſtructed in any Veſſels by any Preſſure, may paſs off by other Veſſels that are not obſtructed; and ſince the Moment of the Blood in the Veſſels leſſens, and the Friction from the Veſſels encreaſes as it approaches the Extremities; and ſince many of the leſſer Veſſels are more expos'd to preſſure than any of the large ones, theſe Communications in the leſſer Veſſels are made ſo much the more numerous. By means of theſe Communications, the Blood circulates in a Limb that has had part Amputated, and into any Veſſels that have been ſeparated from the Trunks that ſupplied them, which otherwiſe muſt have mortified for want of Nouriſhment, and with them for the ſame Reaſon, all the Branches that ariſe from ſuch ſeparated Veſſels; and I can diſcern no other way than by theſe Communications, that the Fluids contain'd in a large Inflammation, can ſuppurate into one Cavity.

If we inject by the Arteries a large quantity of a coloured Fluid, we find all the Veins full of that Liquor, before any of the ſolid parts are much colour'd with it, and upon frequent repetitions all of them much leſs coloured then I think might be expected, if it had gone into any thing near all the Veſſels of the Body; and I have often thrown Wax or Tallow coloured with Vermilion or Verdigreaſe, through all the Arteries, and back again through the Veins, even to the Heart, every where filling Veſſels that cannot be diſcern'd without a Microſcope; and all this without filling or much diſcolouring any one entire part. In viewing with a Microſcope the Circulation of the Blood in the Tail of a Fiſh, the Eye eaſily traces Arteries to their Extremities, and their return in Veins, yet all the Veſſels we can ſee make but a ſmall part of the whole of what we ſee: And tho' we are taught that the whole Animal Body, is a Compages of Veſſels ſuch as we ſee, if it were ſo, I think we could not well diſtinguiſh any, and if the Sum of the Diameters of all the Veſſels we can ſee, are to that of the Breadths and Thickneſſes of all the reſt of the parts, which we ſee at the ſame time, taken together, but as one to five, Theſe Veſſels then are but the Hundred and Twenty Fifth part, of what we ſee with them. What then ſhall we ſuppoſe the reſt of the Tail, and thoſe parts which were ſo little ting'd, and thoſe which were not filled with Wax, in the foregoing experiments, compoſed of? Are they not compoſed of Veſſels which ariſe from the Arteries, as Excretory Ducts do in a Gland, but terminate in the Veins? And theſe Veſſels being only to convey the Nutritious Juices, and what elſe may be a proper Vehicle for them, is it not fit the Circulation in them ſhould be exceeding ſlow, that the Nutritious Particles may adhere the eaſier to the Fibres of the Veſſels, which they are to augment or repair? And are not theſe Veſſels the ſeat of Œdematous ſwellings, and is not the ſlow return of the Fluid, into an Œdematous part after preſſure; an argument of the ſlowneſs of motion of the Fluids in theſe Veſſels, and is not the readineſs with which it recedes from any Part preſs'd, to all the parts about that preſſure, a proof of a vaſt Number of Communications in theſe Veſſels? And if there are ſuch Veſſels as theſe, the Velocity of the motion of their Fluid will not depend upon any proportion they bare to the Veſſels they ariſe from, but upon the Velocity with which their Fluids are Separated from the Arteries into them, and the Proportion of the Sections of all their Orifices to the Sum of their own Sections, at any diſtance where we would compare the Velocity of their Fluid. But to know theſe things in this manner ſeems impoſſible. And the ſtrength of the Coats of theſe Veſſels, may not only be as much leſs than the ſtrength of the Coats of an Artery, as their Diameters are leſs, but alſo leſs I think in that proportion in which the Velocity of their Fluids is leſs, and the Motions more uniform, than the Velocity and motion of the Blood in an Artery.

The Coats of the Veins are much thinner than thoſe of the Arteries, comparing Veſſels whoſe Sections are equal, becauſe the Blood moving ſlower in the Veins than the Arteries, it preſſes with leſs moment againſt their Sides: And beſides the Blood in the Veins has nearly an equal uniform motion, but in the Arteries a very unequal one, and that will require a farther difference in the ſtrength of their Coats; for thoſe of the Arteries muſt be equal to the greateſt natural preſſure; and if the Arterial Blood propels the Venal, that is another reaſon for the different ſtrength of their Coats.

All theſe things being conſidered, it appears to me to be an exceeding difficult thing to determine nearly, what proportion the Fluids of an Animal Body bear to the Solids, or to determine what proportion the ſum of all the Areas of the Minuteſt Arteries bear to the *Aorta*, without which I think we can neither determine the comparitive Velocity of the Blood moving in the Minuteſt Veſſels, nor the quantity of Blood in any Animal Body, nor the time in which the whole Maſs of Blood, or a quantity equal to the whole Maſs is flowing through the Heart. But if each Ventricle of the Heart holds Five Ounces of Blood, and they are filled and emptied every Syſtole and Diaſtole, which I think I can demonſtrate, and if Eighty Pulſes in a Minute be allow'd to be a common Number, there then flows Twenty Five Pounds of Blood through each Ventricle of the Heart, and through the Lungs in a Minute. Dr. *Keill* has ſhown that the ſum of all the Fluids in a Man, exceed the ſum of all the Solids, and yet the quantity of Blood which all the Viſſible Arteries of a Man will contain, is leſs than two pounds, and if we may ſuppoſe all the Viſſible Veins including the *Vena Portæ*, hold Four times as much: The whole then that the Viſſible Veſſels can contain, is about Ten pounds, but the whole that they do contain, is but very little more than the Veins can contain, ſeeing the Arteries are always found almoſt empty in Dead Bodies, but how much the inviſible Arteries and Veins contain, I mean thoſe which contain ſuch a Compound Fluid, as is found in the larger Veſſels, I know no way to judge, unleſs we knew what proportion theſe Veſſels bear to thoſe that carry the Nutritious Juices and *Serum*, (if there are any ſuch) without the *Globuli* of the Blood; if theſe things were known, we might then perhaps determine the comparative Velocity of the Blood in the minuteſt Veſſels.

CÆTERIS PARIBUS, is not the Veocity of Blood in all Animals, proportionable to their quantity of Action, and is not their neceſſity of Food alſo in proportion to their quantity of Action? If ſo, we may ſee how it comes to paſs, that Animals that uſe no Exerciſe, and whoſe Blood moves extreamly ſlow in the Winter, can ſubſiſt without any freſh ſupply of Food, while others that uſe a little more Exerciſe, require a little more Food, and thoſe who uſe equal exerciſe Winter and Summer, require equal quantities of Food at all times, the end of Eating and Drinking, being to repair what Exerciſe and the Motion of the Blood has deſtroy'd or made uſeleſs; and is not the leſs Velocity of the Blood in ſome Animals than in others, the reaſon why Wounds and Bruiſes in thoſe Animals do not ſo ſoon deſtroy Life, as they do in Animals, whoſe Blood moves ſwifter.

CHAP. X.

Of the LYMPHATICKS.

LYMPHÆDUCTS are ſmall pellucid cylindrical Tubes which ariſe inviſible from the Extremities of the Arteries throughout the whole Body, but more plentifully in Glands than other Parts, and in greateſt Number from ſuch Glands as ſeparate the viſcideſt Fluids, as may be obſerv'd in the Liver and *Teſtes*; they cannot be diſcern'd in a natural State to have more than one Coat, and that exceeding thin, having Valves at ſmall and uncertain Diſtances, to prevent the regreſs of their Fluid. They have frequent Communications like the Veins, but do not unite ſo often; the larger Trunks are in many places attended with ſmall Glands, thro' which they run, and at the ſame time ſend communicant Branches over them, that they might be ſecur'd againſt Obſtructions from Diſeaſes in thoſe Glands. They all terminate in the *Via Lactea*, or in the left ſubclavian Vein. All that ariſe below the Diaphragm, empty into the *Venæ Lacteæ ſecundi generis* and *Receptaculum Chyli*; thoſe in the Cavity of the *Thorax* into the *Ductus Thoracicus*; and thoſe of the ſuperior Parts into the left ſubclavian Vein. Their Uſes are to carry Lymph to dilute the Chyle, to make it incorporate more readily with the Blood (but not to make it flow the better in the *Lacteals*, as appears ſufficiently from their not entering into the minuteſt *Lacteals*) and to carry off ſo much Lymph as is neceſſary to leave the Blood in fit Temper to flow thro' the Veins; for it is always obſerved that in ſuch Perſons as have their Blood too thin, the *Globuli* cohere and form *Molecula* or *Polypus*'s, which I imagine muſt ariſe from the *Globuli* of the Blood not rubbing often enough, and with ſufficient Force one againſt another to diſunite them as faſt as they cohere. Theſe Polypuſes are frequently found in all the large Veins, and in the right Auricle rnd Ventricle of the Heart, eſpecially in ſuch Bodies as Die of Cronic Diſeaſes.

Authors have hitherto deſcrib'd and painted theſe Veſſels like Strings of Poppies: As they appear when injected with *Mercury*; becauſe the Coat of theſe Veſſels being exceeding thin, it is not able any where between the *Valves* to reſiſt the *Mercury*'s attracting it ſelf into Globules, and the ſame Appearance alſo happens when they are præter-naturally diſtended, becauſes *Valves* hindering a Diſtention where they are ſeated, the Spaces between them approach to a ſpherical Figure from the equal preſſure of the Fluid, according to the Degree of their Diſtention; but in a natural State when they are fill'd with Lymph, or when they are moderately injected with Air or Water, they always appear as cylindrical as the Veins. Any of theſe Veſſels being burſt, they cauſe a Dropſie in the Cavity into which they open, which is oftener in the *Abdomen* than the *Thorax*; this kind of Dropſie is ſometimes, tho' very rarely cur'd by Tapping, and I believe the chief Reaſon why ſo few are Cur'd by that Operation is, becauſe this Diſeaſe generally has its Riſe from a ſchirous Liver. Out of a vaſt Number that I have open'd, I remember but one whoſe Liver appear'd ſound, which was of a Captain of a Man of War, whoſe Caſe being very extraordinary, I will relate it from a Journal which he kept himſelf. His way of Life expoſing him to drink more than he thought could be conſiſtent with his Health, he reſolv'd on a ſudden to forbear drinking any ſtrong Liquors; and this being in Winter-time, and he catching ſome Colds in ſtormy Weather, He firſt became Rheumatick and then Dropſical; and then he came to *London* for a Cure, *October* the 4*th* 1710; he was tapp'd by Mr. *Ferne*, who took away all the Water which was about five Gallons; but the *Abdomen* filling again very faſt, he tapp'd him again, *October* the 28*th*. *November* the 18*th*. *December* the 1*ſt*. *December* the 30*th*. *January* the 16*th*. and on *February* the 17*th* Mr. *Ferne* being indiſpos'd, he was tapp'd by Mr. *Will. Smith*; and on *February* the 24*th*, by Mr. *Ferne*: On *March* the 17*th*. Mr. *Ferne* and my ſelf, there being a Rupture at the Navel, open'd that with a Launcet, and let out all the Water that Way, and endeavoured to make a *Fiſtula* there to prevent future Tapping, but in vain, for when the Belly was emptied of Water, the Orifice would cloſe up; he not being able to bear a Sponge-Tent to keep it open; and on *March* the 24*th* 1711, we open'd it again at the Navel with a Launcet, and on *April* the 7*th*. Mr. *Ferne* open'd the Navel, and again on *April* the 22*d*. at which Time there being accidentally preſent one Mr. *Spirling* a Barber, who pretending to Surgery, and having obſerv'd how Mr. *Ferne* did it, undertook to make the Apperture in the ſame Manner, which was by pinching up the Skin, and cutting of it as is uſually done in making of Iſſues; this was on the 30*th* of *April*; he perform'd it again

gain in *May*, about the 20*th* Day: And again on the 11*th* of *June*; but he not doing it to the Captain's Satisfaction was after this Time iſcharged, and Mr. *Ferne* was deſir'd to do the Operation again, but the Gentleman being far-her in the Country than Mr. *Ferne* could conve-iently go, I was deſir'd to attend him, which I did afterwards, and tapp'd him on *June* the 25*th*. *July* about the 4*th* or 5*th*. *July* the 16*th*. *July* the 26*th*. *Auguſt* the 2*d*. *Auguſt* the 11*th*. *Auguſt* the 18*th*. *Auguſt* the 25*th*. *September* the 1*ſt*. *September* the 8*th* *September* the 15*th*, and on *September* the 17*th*. the Water burſt out of it ſelf. I open'd it again on *September* the 27*th* a few Days fter which he died; after 29 times tapping and nce opening it ſelf. At all which Times he loſt bove ſeventy Gallons of Water. When he was irſt tapp'd he was ſo weak he could ſcarce ſit in Chair; but he ſoon gather'd Strength, went nto the Country, and drove himſelf in a Chaiſe: About the 17*th* Time he drove himſelf out of the Country, and was tapp'd at my Houſe, and drove imſelf home immediately after; and at other Times would go out immediately after Tapping. ut for about three Weeks before he died, he was lmoſt conſtantly troubled with Rheumatick Pains, nd Bled frequently at the Noſe, which ſeem'd to e the moſt immediate Cauſe of his Death.

Since the Writing of this I opened a Woman who died of a Dropſie in the Liver, the Gibous art was entirely waſted, and the Coat of the Liver was about a Quarter of an Inch thick and contained about Five Gallons of a groſs yellowiſh Fluid, in which were many Hydatids about the Size of Gooſeberries, and ſome pieces of Matter of as bright a Red as Vermillion. At about Fourteen Years of Age ſhe firſt began to feel Pain in this part, which returned Monthly, but in time grew continual, Her Belly conſtantly encreaſing till ſhe died, which was in the Twenty Eigth Year of her Age, without ever having had her *Menſes*. All the other *viſcera* both in the *Thorax* and *Abdomen* were perfectly ſound, nor was there the leaſt ſign of a Dropſie in any of the Limbs, or yellowneſs in the Skin, which is common in diſeaſes of the Liver.

CHAP. XI.

Of the LYMPHATICK GLANDS.

THE GLANDS accompanying the *Lymphaticks*, are ſituated in the three Cavities in the Interſtices of the Muſcles, where the *Lymphaticks* lie with the large Blood-Veſſels, and in the four Emunctories, *viz.* the Arm-Pits and Groin. In the Brain is ſeated the *Glandula Pinealis*, which I judge to be of this Sort, having often ſeen large *Lymphæducts* running into it from the *Plexus Choroides*, and at the Baſis of the Brain in the *Sella Turcica* is the *Glandula Pituitaria*, into which enters a large Lymphatick, nam'd

In-

nfundibulum, (*Vid.* Chap. *Of the Brain.*) In the Neck are ſituated a great many of theſe by the ides of the Carotid Arteries and internal Jugu- ar Veins, and two, or a ſort of double one upon he *Larynx* immediately below the Thyroid Car- ilage, from which Situation they derive the lame of *Thyroideæ*, and juſt within the *Thorax* ſeated another call'd *Thymus*; in very young hildren the *Thymus* is as large or larger than e Thyroid Glands; But in Men theſe Glands e very large, and the *Thymus* very ſmall, the rmer having encreaſed in about a double Pro- rtion of any other Gland of this kind, and e latter having rather diminiſhed than en- eaſed. But in Brutes, ſuch as have fall'n under y Obſervation, it is juſt contrary; from which ſervations I am inclin'd to conclude, that they th belong to the very ſame Lymphaticks, and at either of them encreaſing as much as both ght to do, if both encreas'd, anſwers the ſame d as if both did; and that the Reaſon why the *ymus* encreaſes rather than the Thyroid Glands Brutes is becauſe the Shape of their *Thorax* ords convenient Room for it to lodge in; and it in Men the Thyroid Glands encreaſed ſo ch, becauſe there is no Room in that Part of *Thorax* where the *Thymus* is ſeated, for a ge Gland to be lodg'd. In Dogs, a Porpuſs, ſome other Animals, I have ſeen the Lym- tticks in the *Thymus* and between the *Thymus* *Ductus Thoracicus* full of Chyle, and ſo in many other Lymphaticks near the *Via Lactea*. Under the Baſis of the Heart, and at the Sides of theLungs where the greatVeſſels enter,are many of theſe Glands from the Size of a Pea to that of a Hazel-Nut. In the *Abdomen* upon the Loins near the Kidneys, and by the Sides of the Iliac Veſſels are many of theſe Glands, they are call'd *Lumbales*, and there are ſome at the hollow Side of the Liver, nam'd *Hepaticæ*, and the Meſentery is full of Glands of a like Appearance, but they ſeem to belong only to the Lacteal Veins, unleſs ſome of them belong to the Lymphaticks that come from the Liver, which are ſeated at the *Baſis* of the Meſentery among the *Venæ Lacteæ ſecundi generis*, where the Hepatick Lymphaticks paſs in their way to the *Receptaculum Chyli*. The Glands which accompany the Blood-Veſſels in the Limbs are few, and diſtributed in no certain Order; except thoſe in the four Emunctories, *i. e.* in the Arm-Pits and Groins, nam'd *Axilares* and *Inguinales*.

Brutes have ſome large ones in the Thigh, commonly call'd the *Pope's-Eye*; theſe are ſeated about the great Veſſels in the Thigh, where they paſs thro' the *Triceps* Muſcle. From this Situation, and not from any thing extraordinary in theſeGlands it is that Wounds are there ſo dangerous. Theſe Glands are ſaid by *Nuck* and others after him, to be compos'd of Veſſicles, and not of Veſſels, like other Glands; and that theſe Veſſicles are Repoſitories of Lymph, but from their Appearance in a natural State which is very compact and uniform; there ſeems to me to be but little Reaſon for ſuch a Conjecture. Some have thought their Uſe to be by contracting to accelerate the motion of the Fluid in the Lymphatics; But that does not ſeem very probable, becauſe a ſtronger Coat would have been the readieſt Means to produce that Effect; beſides theſe Veſſels never enter any of 'em without detaching a Branch over at the ſame time perhaps to prevent Obſtructions. And if theſe Glands were endu'd with a Contracting Power, which is only preſum'd without any Proof, It would ſtill be difficult to conceive how ſuch a Power apply'd at uncertain Spaces, ſhould not rather obſtruct than accelerate the Motion of Lymph in the Lymphatics, unleſs there were *Valves* to prevent a Reflux; and even then, if this were a convenient Piece of Mechaniſm, it would be very ſtrange that it ſhould no where elſe in the Body be made uſe of.

CHAP. XII.

Of the Courſe of the ALIMENT *and* FLUIDS, *Abſtracted from the foregoing Chapters.*

THE ALIMENT being receiv'd into the Mouth, is there maſticated by the Teeth, and impregnated with *Saliva*, which is reſs'd out of the Salivary Glands by the Motions of the Jaw and the Muſcles that move it and the Tongue. *(See from Page one Hundred and Twenty One, to Page One Hundred and Twenty Five.)*

Then it deſcends thro' the *Pharynx* into the Stomach, where it is digeſted by the Juices of the Stomach, (which are what is thrown out of the Glands of its inmoſt Coat, and *Saliva* out of the Mouth) and a moderate Warmth and Attrition. *(See from Page One Hundred and Twenty Eight, to Page One Hundred and Thirty Three.)*

Then it is thrown thro' the *Pylorus* or right Orifice of the Stomach into the *Duodenum*, where it is mix'd with Bile from the Gall-Bladder and Liver ; and the Pancreatic Juice, from the Pancreatic Gland. Theſe Fluids ſerve further to attenuate and dilute the digeſted Aliment, and probably, to make the Fluid Part ſeparate better from the *Fæces*. After this it is continually mov'd by the Periſtaltic or Vermicular Motion of the Guts, and the Compreſſion of the Diaphragm and Abdominal Muſcles, by which forces the fluid parts are preſs'd into the Lacteals, and the groſs parts thro' the Guts to the *Anus*. *(See from Page One Hundred and Thirty Three, to Page One Hundred and Thirty Six, and from one Hundred and Forty Two, to Page one Hundred and Forty Nine.)*

The Chyle, or thin and Milky part of the Aliment, being receiv'd into the Lacteals from all the ſmall Guts, they carry it into the *Receptaculum Chyli*, and from thence the *Ductus Thoracicus* carries it into the left Subclavian Vein, where it mixes with the Blood, and paſſes with it to the Heart. (*See from Page One Hundred and Forty Nine, to Page one Hundred and Fifty.*)

All the Veins being empty'd into Two Branches, *viz.* the aſcending and deſcending *Cava*, they empty into the right Auricle of the Heart; the right Auricle unloads into the right Ventricle, which throws the Blood thro' the Plumonary Artery into the Lungs; from the Lungs, the Blood is brought by the Pulmonary Veins into the left Auricle, and from that into the left Ventricle; by which it is thrown into the *Aorta*, and diſtributed thro' the Body. From the Extremities of the Arteries, ariſe the Veins and Lymphatics, the Veins to collect the Blood and bring it back to the Heart, and the Lymphatics to return the Lymph, or thinner part of the Blood; from the Arteries, to the *Via Lactea*, where it mixes with the Chyle, and then paſſes with it into the Left Subclavian Vein and to the Heart. (*See from Page One Hundred and Fifty Seven to Page One Hundred and Ninety.*)

All the Fluids that paſs into the Stomach and Guts being carryed into the Blood-Veſſels, the greateſt part of 'em are ſeparated and carry'd off by proper Veſſels, *viz.* Urine from the Kidneys, Bile from the Liver, &c. And theſe Juices carry along with them whatever might be injurious to the Animal Œconomy. (*See from Page One Hundred and Fifty to Page One Hundred and Fifty One.*

CHAP. XIII.

Of the DURA MATER *and* PIA MATER.

DURA MATER, is a very compact ſtrong Membrane lining the inſide of the Scull, firmly adhering at its Baſis, and but lightly at the upper part. It has Three Proceſſes: The firſt nam'd *Falx*, begins at the *Criſta Galli*, and runs backwards under the *Sutura Sagittalis* to the *Cerebellum*, dividing the *Cerebrum* into Two Hemiſpheres. Its Uſe is ſaid to be, to ſupport one ſide of the *Cerebrum* from preſſing on the other when the Head is inclin'd to one ſide. But I think it is evident that this is not the Uſe, becauſe there would be more need of ſuch a Proceſs from one ſide of the Scull to the other, than this way; and it would be alſo very neceſſary that it ſhould run through the Brain, to Anſwer that end. The Principal uſe appears to me to be to divide the Brain into ſuch Portions as are leaſt liable to be mov'd in the Scull, by any violent motions of the Head, which is better done this way than it would the other; and the under-ſide of the Brain is kept ſteady by the inequalities of the Baſis of the Scull, which the Brain is exactly fitted to. In Brutes, the *Falx* is always very ſmall, therefore in thoſe whoſe Brains are of the larger ſize, as Oxen, Sheep, Horſes, *&c.* The upper part of the Scull is made uneven, exactly to fit the folds of the Brain, which ſecures the upper parts of their Brains from concuſſions, in the ſame manner that the lower parts are ſecur'd. The Second Proceſs runs from the lower and back-part of the former to the upper Edge of each *Os Petroſum*, and ſuſtains the Poſterior Lobes of the *Cerebrum*, that they might not compreſs the *Cerebellum.* In ſuch rapacious Animals as I have diſſected, this Proceſs is Bone. The third is very ſmall, ſometimes not to be diſtinguiſh'd; it runs from the laſt deſcrib'd Proceſs down towards the great *Foramen* of the Scull, and poſſeſſes the ſmall ſpace in the *Cerebellum* between the *Proceſſus Vermiformes.* Theſe Proceſſes of the *Dura Mater*, ſerve alſo to keep the Brain ſteady [illegible]

The *Dura Mater* has alſo to be obſerved in it ſeveral Sinuſes, which are large Veins to receive the Blood from the leſſer Veins of the Brain: Their number is uncertain, and thoſe that are conſtant, are not deſcrib'd in the ſame Order by Writers. The firſt that preſents it ſelf is, the *Longitudinalis ſuperior*, running from a blind Hole a little above the *Criſta Galli* all along the upper Edge of the *Falx.* A tranſverſe ſection of this Veſſel is not Circular, like other Veſſels, but a Triangle whoſe ſides are arches of a Circle; the upper ſide convex outwards, and the two lower convex inwards; the figure of this Veſſel, is preſerv'd by ſmall Ligaments running a-croſs in the inſide that it might not become conical, or cylindrical, like other Veſſels, from the equal preſſure of the contain'd Blood, and thereby incommode the upper Edges of each Hemiſphere of the *Cerebrum.* On the lower Edge of this Proceſs, is generally another very ſmall one, call'd *Longitudinalis inferior*; this runs into the *Rectus*, and when wanting is ſupply'd by a Vein; *Rectus* runs between the Two firſt Proceſſes of the *Dura Mater*, and unloads with the *Sinus Longitudinalis ſuperior* into the Two lateral Sinuſes. There is ſometimes a ſmall one in the third Proceſs, which empties in the ſame place with the former. From the endings of the *Longitudinal* and ſtreight Sinuſes, begin the Two *Lateral* Sinuſes, which when they come to the *Os Petroſum*, dip down and paſs thro' the Eighth *Foramina* into the internal Jugular Veins. There is another nam'd *Circularis*, it runs round the fore-part only of the *Sella Turcica*; the two Ends of this empty into Four Sinuſes, one on the Top of each *Os Petroſum*, which paſs into the *Sinus Laterales*, and one at the under ſides of the ſame Bones, which paſs indifferently into both the Lateral and Cervical Sinuſes; theſe Two laſt Sinuſes have always communicant Branches. The Cervical Sinuſes run from the Baſis of the Scull thro' the great Foramen on both ſides the *Medulla Spinalis Colli*, and thro' the Tranſverſe Proceſſes of the *Cervical Vertebræ*; the laſt of theſe, have many times, proper *Foramina*, running from the Eighth *Foramina* to the back-part of the *Apophyſes* of the *Occipital* Bone. There are alſo Two more of theſe Veſſels, which run from the Circular Sinus between the *Os Sphenoides* and fore-part of the *Os Petroſum* directly into the Internal Jugular Veins.

PIA MATER, is an exceeding fine Membrane immediately inveſting the Brain, even between its Lobes, Hemiſpheres and Folds. It ſerves to contain the Brain, and ſupport its Blood-veſſels, which run here in great numbers; for the Arteries to divide into ſmall Branches upon, that the Blood contain'd may not enter the Brain too impetuouſly; and for the Veins to unite on, that they may enter the Sinuſes without difficulty. Some pretend, That there is another Membrane under the *Pia Mater*, which I cou'd never diſcover, and therefore will not deſcribe.

I have once ſeen a large part of the *Dura Mater*, and once part of the *Pia Mater* oſſify'd.

CHAP. XIV.

Of the CEREBRUM, CEREBELLUM, MEDULLA OBLONGATA *and* MEDULLA SPINALIS.

CEREBRUM, is that part of the Brain which poſſeſſes all the upper and fore-part of the *Cranium*, being ſeparated from the *Cerebellum* by the ſecond Proceſs of the *Dura Mater.* Its upper ſide is divided into Two Hemiſpheres, and its lower ſide into Four Lobes, Two call'd anterior, and Two poſterior, which latter are much the largeſt; at the meeting of the Four Lobes, appears the *Infundibulum,* which is a large Lymphatic running from the Ventricles of the Brain into the *Glandula Pituitaria.* This Gland is ſeated in the *Sella Turcica.* Immediately behind the *Infundibulum* appear Two ſmall Bodies, nam'd *Protuberantiæ duæ albæ pone Infundibulum.* Between the Two Hemiſpheres of the *Cerebrum,* lower than the Circumvolutions, appears a White Body nam'd *Corpus Calloſum.* Under the *Corpus Calloſum,* appear the Two Lateral or Superior Ventricles, which are divided into right and left by a very thin Membrane, nam'd *Septum Lucidum,* which is extended between the *Corpus Calloſum* and *Fornix.* The *Fornix* is a Medullary Body, beginning from the fore-part of theſe Ventricles, with Two ſmall Roots which ſoon unite; and running towards the back-part, where they divide into Two parts, call'd *Crura Fornicis.* In the Baſis of theſe Two Ventricles, are four Prominences, the Two anterior are call'd (becauſe of their inner Texture) *Corpora Striata.* The other Two are nam'd *Thalami Nervorum Opticorum.* Beyond theſe, are Two more Proceſſes, call'd *Nates*: And under them nearer the *Cerebellum*, Two call'd *Teſtes.* On the upper part of the *Nates*, is ſituated the *Glandula Pinealis*, famous for being ſuppoſed by *Des Cartes* the Seat of the Soul. And upon the *Thalami Nervorum Opticorum*, are a number of Blood-Veſſels, Glands, and Lympheducts, call'd *Plexus Choroides.* Under the beginning of the *Fornix*, is a ſmall *Foramen* call'd *Foramen ad Radices Fornicis*: And under the middle of the *Fornix*, one call'd *Foramen poſterius* which is cover'd with a Valve nam'd *Membrana* or *Valvula major*; and the Space under the Two anterior Ventricles between the *Foramina* and the *Cerebellum*, is the third Ventricle.

CEREBELLUM, is ſituated under the ſecond Proceſs of the *Dura Mater.* By dividing this part of the Brain lengthways, we diſcover the fourth Ventricle, whoſe Extremity, is call'd *Calamus Scriptorius*; to theſe are obſerved Two Medullary Bodies call'd *Pedunculi*, which are the Baſis of the *Cerebellum.*

The Subſtance of the Brain is diſtinguiſh'd into outer and inner; the former is call'd *Corticalis Cinerea* or *Glanduloſa*, the latter *Medullaris*, *Alba*, or *Nervea*.

MEDULLA OBLONGATA, is a Medullary Production on the under part of the *Cerebrum* and *Cerebellum*: It firſt appears in Two Bodies, from the anterior part of the poſterior Lobes of the *Cerebrum*, call'd *Crura Medullæ Oblongatæ*. The union of theſe *Crura* between the *Cerebrum* and *Cerebellum*, is call'd *Iſthmus*; and immediately beyond this, is an Eminence, nam'd *Proceſſus Annularis*.

MEDULLA SPINALIS, is a Production of the *Medulla Oblongata* thro' the great *Foramen* of the Scull, and thro' the Channel of the Spine. The Coats of this Part are the ſame with thoſe of the Brain; it is divided its whole length by a thin Membrane, and ſo we ſuppoſe, the *Medulla Oblongata*. The lower part of the *Medulla Spinalis*, is call'd *Cauda Equina*.

Wounds in the *Cerebrum* are not Mortal; but in the *Cerebellum* and *Medulla Oblongata*, they cauſe preſent Death; and in the *Medulla Spinalis*, loſs of Senſe in all the Parts which receive Nerves from below the Wound. In Perſons that have died *Lethargic*, I have always found the Brain full of Water; and in Children the Brain is always very ſoft and moiſt. In a Man that died of an Appoplexy I found all the Veſſels of the Brain immoderately diſtended with Blood, and the Ventricles and the ſubſtance of the Brain full of Lymph, and the *Dura Mater* very much thickened, and adhering ſo very looſely, that the greateſt part of it was ſeparated without breaking.

I have twice ſeen in the *Cerebrum* a Schirrous Tumor as large as a Pullet's Egg. And in another Body, Impoſtumations which poſſeſs'd near two Thirds of the Whole *Cerebrum*. And in a Perſon that dy'd with a *Gutta Serena*, I found all the Ventricles of the Brain full of Lymph; and the *Thalami Nervorum Opticorum* and the Optick Nerves, e'er they went out of the Scull, made flat with the preſſure. And in an old Man I found the right Optick Nerve waſted, and black.

CHAP. XV.

Of the NERVES.

THE NERVES, are in Number Forty Pair, Ten Pair of which ariſe from the *Medulla Oblongata* within the Scull, and are call'd Nerves of the Brain; the reſt ariſe from the *Medulla Spinalis*. The Seven Pair of the Neck, are call'd *Cervicales*. The Twelve of the Back, *Dorſales*. The Five of the Loyns, *Lumbales*. And there are Six which paſs out of the *Os Sacrum.* They ſeem, when examin'd with a Microſcope, to be Bundles of ſtreight Fibres not communicating with one another: And I am inclin'd to think that every, the Minuteſt Nerve, terminating in any part, is a diſtinct Cord from its origin in the Brain, or Spinal Marrow; or elſe I do not ſee how they could produce diſtinct Senſations in every part; and the diſtinct points of Senſation throughout the Body, are ſo very numerous, that the whole Body of Nerves (which taken together would not make a Cord of an Inch Diameter) muſt be divided into ſuch a Number, to afford one for every part that has a diſtinct Senſation, that ſurely each Nerve wou'd be too ſmall to be ſeen by the beſt Microſcope; they all paſs in as direct Courſes to the Places they ſerve as is poſſible, never ſeparating nor joining with one another but at very acute Angles, unleſs where they unite in thoſe Knots which are call'd *Ganglions*, the uſe of which I do not pretend to know; they make what appears to be a Communication of moſt of the Nerves on the ſame ſide, but never Join Nerves of oppoſite ſides.

The NERVES of the BRAIN, I ſhall deſcribe in Order: But from what Parts they ariſe within the Brain, I do not pretend to ſhow, tho' Anatomiſts deſcribe 'em, as if they had trac'd 'em from their Beginnings; nor have they been leſs definitive in the Deſcriptions of their Terminations, where they frequently deſcribe Nervous Plexuſes, which in their Prints are made Tranverſe interweavings, which is a Structure that I have never been able to obſerve among the Nerves, and which is not agreeable to the general diſpoſition of them, ſince they every where in the ſame parts, as far as I can diſcern, run as nearly Parallel one to another as is poſſible.

The firſt Pair of Nerves, as they are call'd by Dr. *Willis*, or the *Proceſſus Mammillaris* of the Brain, in Men are ſmall, but in ſome Brutes and ſuch as have no nice Senſe of Smelling, they are very large and hollow; they paſs directly towards the *Os Ethmoides*, thro' whoſe *Foramina* they are ſaid to paſs to the Membranes of the Noſe, to be expanded on them for the Senſe of Smelling. But the leaſt care in diſſection will clearly ſhow, that they do not paſs out of the Scull; and the great Cavities which there are in theſe Proceſſes in Sheep and Oxen, evidently ſhow them Appendexes to the Third Ventricle of the Brain, with which their Cavities Communicate, but in Men I can no more conceive what may be their uſe, than I can of any other part of the Brain.

The Second Pair of Nerves, are the Optic, which are round and Medullary; they ariſe ſingle, and then uniting at the fore-part of the *Cella Turcica*, they divide again, and paſs out at the firſt *Foramina* of the Scull to the bottom of the Eyes, where they enter, and expanding themſelves form the *Tunica Retina*, upon which Objects are painted. (*Vid.* Chap. *Of the Eyes.*)

The Third Pair of Nerves are ſmall, they paſs out of the ſecond *Foramina*, or *Foramina Lacera*, and are beſtow'd upon the Eyes, the Membranes, and Glands in the Orbits, and ſome of the Muſcles.

The Fourth Pair of Nerves are the ſmalleſt, and are call'd *Pathetici*; they go out of the ſecond *Foramina*, or *Foramina Lacera*, to the *Muſculi Trochleares*, or *Obliqui ſuperiores*, *Oculorum*, and the Neighbouring parts.

The Fifth Pair of Nerves are the largeſt of all; after they have pierc'd the *Dura Mater*, they each Unite more cloſely, and then ſend One Branch thro' the *Foramen Lacerum vel ſecundum* into the Orbits of the Eyes, thro' which Branches are given to the Coats and Muſcles of the Eyes; and One thro' a Notch at the upper Edge of the Orbits to the Forehead. The next Branch, which is larger, paſſes thro' the third *Foramen* of the Scull, and a *Foramen* in the *Maxilla ſuperior* juſt under the Orbit of the Eye; this is beſtow'd upon the Face. The third, and largeſt Branch of this Nerve, is beſtow'd upon the Tongue, Jaws, Mouth, Noſe, Chin, Teeth, and all the Parts near the Jaws, and One ſmall Branch goes to the Cervicals. This Nerve I take to be both the Guſtatory and Olfactory.

The Sixth Pair of Nerves ſend One Branch into the Orbits of the Eyes, and One thro' the ſixth *Foramina* of the Scull, which after joyns a

Branch of the fifth, and is diſtributed to the Tongue and down the Neck.

The Seventh Pair of Nerves are compos'd of a *Portio Dura*; and a *Portio Mollis*. The latter is ſpread within the Ear for the Senſe of Hearing; and the former paſſes out behind the *Proceſſus Styliformis*, and is beſtow'd upon the Ears, Face, Tongue, and adjacent Parts.

The Eighth Pair of Nerves, or *Par Vagum*, go out of the eighth *Foramina* of the Scull; but before they go out, they each receive a Nerve from the ſuperior part of the *Medulla Spinalis*, nam'd *Acceſſorius*. They deſcend on both ſides the *Larynx* to the *Thorax*, where they each form a *Ganglion*, and return a Nerve, nam'd *Recurrens*, to the *Larynx*; the right turns round the right Subclavian Artery, and the left round the *Ductus Arterioſus*, and paſſes under the beginning of the deſcending *Aorta*. It is generally ſaid that theſe Nerves being divided in a Dog prevents his barking, which Experiment I have made, but found it otherwiſe. The larger Trunks of theſe Nerves, paſſing down by the ſides of the *Pharynx*, communicate and beſtow Branches upon the Heart, Lungs and *Pharynx*, and the remaining Parts are beſtow'd upon the Stomach.

The Ninth Pair of Nerves, go out of the Ninth *Foramina* of the Scull, and are beſtow'd upon the Muſcles thereabouts.

The Tenth Pair, go out between the Scull and the firſt *Vertebra*, and are diſtributed among the adjacent Parts. This Pair of Nerves is reckon'd among thoſe of the Scull, and not thoſe of the Spine, becauſe it does not ariſe double on each ſide and joyn with a Ganglion, as all the other Spinal Nerves do.

From theſe laſt deſcrib'd Nerves, and ſome others thereabouts, ariſe ſome ſmall Branches of Nerves on each ſide, which ſoon unite about the fore-part of the ſecond *Vertebræ*, in larger Ganglions than are found in any other Part of the Body; after which they part with ſome very Minute Twigs, and then deſcend through the Neck, near to the *Par Vagum*, and paſſing through the *Thorax* near the Spine, they receive Branches, which join them with a Ganglion, from every one of the intercoſtal Nerves, and ſome of the uppermoſt of the Loins, and towards the Lower Part of the *Thorax*, and upper part of the Loins, they detach ſeveral Branches, which ſoon join into Two on each ſide, which are chiefly beſtow'd upon the Liver, Spleen, *Pancreas*, Guts and Meſentery.

The Three firſt Pair of Cervical Nerves, are beſtow'd upon the Neck and Shoulders; and from the Fourth and Fifth go off the *Phrenic* Branches to the Diaphragm; which Branches as they Paſs, ſend off Branches to the *Sternum* and *Pericardium*. And the Fourth, Fifth, Sixth, and Seventh, with the firſt of the Back, make the

Subclavian Nerves. The laſt deſcrib'd Pair ſend off Branches under the Two firſt Ribs; which Branches, with the other Eleven Pair of the Back, are all call'd Intercoſtals. The Two firſt of the Loyns, are beſtow'd upon the Loyns; and the Three laſt upon the Fore-parts of the Thighs, to which they run together with the Blood-Veſſels. The Three firſt of the *Sacrum*, are very large, they joyn and form the Poſterior Crural Nerves; and the remaining Nerves of the *Sacrum* are beſtow'd about the Buttocks.

Every one of the Intercoſtal and Lumbal Nerves, ſend off ſmall Branches to the Back and Loins; and thoſe of the *Sacrum* ſend off Branches likewiſe, but they ſeparate within the Spine, and go out backwards at diſtinct Holes. Theſe laſt Nerves of the *Sacrum*, have no Ganglions after they leave the Spine.

The Subclavian Nerves when they are got into the Axilla's with the great Blood Veſſels, divide into Three principal Branches; One of which paſſes along with the Blood-Veſſels towards the Thumb, and is call'd *Nervus Cubitalis ſuperior.* Another paſſes down behind the inner *Apophyſis* of the *Os Humeri* to the Hand, and is call'd *Cubitalis inferior.* And the third Branch, which is leſs than either of theſe, paſſes behind the *Os Humeri*, and is beſtow'd upon the Cubit and Back of the Hand. There is alſo another large Branch detach'd from the Axillary Nerve, thro' the *Coracobrachialis* Muſcle, and is call'd *Perforans*; beſides theſe Branches, they every One as they paſs give off Branches to the Circumjacent Parts. I have ſeen a Palſey and *Atrophy* of both Arms, from a Preſſure made by Crutches upon the Axillary Nerves and Arteries.

The *Cubitalis ſuperior* ſends Two Branches to the Thumb, Two to each of the firſt Fingers, and One to the third Finger; and the *Cubitalis inferior* ſends alſo One to the third Finger, and Two to the little Finger; beſides theſe Branches, they detach many others in their Progreſs.

The Poſterior Crural Nerve deſcends between the Flexors of the *Tibia*, and under the Extenſors of the *Tarſus* to the Foot, where it paſſes under the *Os Calcis*, and then ſoon divides into Two Branches which detach two to each Toe, in the very ſame manner as the *Cubitalis ſuperior* and *inferior* do to the Fingers: A little below the Knee, the Crural Nerve ſends a Branch over the *Fibula* to the fore-part of the Leg, and as it paſſes along, it ſends off Branches to all the other Parts of the Lower Limb.

I think I have here deſcrib'd the Nerves, as far as may be of any uſe to Surgeons in Operations, and as far as may be of any uſe to the underſtanding of the conſent of the Parts; and if this is not enough, I do not ſee where to ſtop, though they may be more properly deſcrib'd to their very ſmall Branches, than other Veſſels, becauſe I never have met, that I remember, in any Author or in any Diſſection, with one *Luſus Naturæ* among the Nerves.

That the Nerves are inſtruments of Senſation, is clearly proved from Experiments, but how they conveigh thoſe Senſations to the Brain, is matter of great diſpute. The moſt general Opinion is, that the Nerves are Tubes to contain Animal Spirits, by whoſe motions theſe Senſations are conveigh'd: And Diligent Enquiry has been made with Microſcopes to diſcover their Cavities, but hitherto in vain; and if each Nerve is diſtinct from its Origin, (as I have endeavour'd to ſhow n the beginning of this Chapter) I doubt whether a ſingle Nerve, is not too ſmall to be the Object of the beſt Microſcope. Some to prove the exiſtance of Animal Spirits in the Nerves, have affirmed, that upon tying any parcel of them,they ſwell on that ſide of the Ligature next their riſe,and ſink on the other ſide,like an Artery: but this I could never ſee, and the Appearance of ſeems to be owing to the Prepoſition of an Hypotheſis. However, I think the Nerves may be ubes, and that a Fluid, whoſe Coheſion is very ttle, and whoſe parts are perhaps no finer than ght, may move very freely in them. Thoſe ho deny Animal Spirits in the Nerves, ſuppoſe at the Senſation is conveigh'd by a Vibration them. To which it is objected, That they ſlack, moiſt, and ſurrounded with ſoft parts, and are therefore unfit for Vibrations, as indeed they are for ſuch as are made on the ſtrings of a Muſical Inſtrument; but the Minuteſt Vibrations, ſuch as they cannot be without, may be as ſufficient for this end, as the impulſe of light upon the *Retina*, is for the Senſe of Seeing. So that for ought that I can diſcern, Senſations may be conveigh'd either, or both ways, tho' the Advocates for each Opinion, have chiefly inſiſted upon the improbability or impoſſibility of the other Opinion.

BOOK IV.

CHAP. I.

Of the Urinary and Genital Parts of Men, together with the GLANDULÆ RENALES.

THE Urinary Parts are the Kidneys with their Veſſels and Bladder of Urine.

The KIDNEYS of Men, are very like thoſe of a Hog, the Two weigh about Twelve Ounces; they are ſeated towards the upper part of the Loyns upon the Two laſt Ribs, the right under the Liver, and a little lower than the other, and the left under the Splene. Their Uſe is to ſeparate the Urine from the Blood, which is brought thither for that Purpoſe by the Emulgent Arteries; and what remains from the Secretion, is return'd by the Emulgent Veins, while the Urine ſecreted is carry'd off through the Ureters to the Bladder. Tab. xiii. F. Tab. xxii. 5.

The URETERS, are Tubes about the bigneſs of a Gooſe-quill; and about a Foot Long, they ariſe from the Hollow ſide of the Kidneys, and end in the Bladder near its Neck, running obliquely Tab. xiii. 6. Tab. xxii. 8.

Tab. xxii. 22. obliquely for the ſpace of an Inch between its Coats; which manner of entering, is to them as Valves. The beginning of the Ureters in the Kidneys, are the *Tubuli Urinarii*, which joyning form the *Pelvis* in each Kidney. Between the *Tubuli Urinarii*, Authors have remark'd ſmall *Papillæ*; and the Parts which diſtinguiſh themſelves by a clearer Colour, they call *Glandulæ*. Tab. xxii. 11. Tab. xxii. 10.

Tab. xiii.H. The **Bladder** of **Urine**, is ſeated in the *Pelvis* of the *Abdomen*; its ſhape is Orbicular, and its Coats are the ſame with thoſe of the Guts, and other hollow Muſcles already deſcrib'd; *viz.* an External Membranous, a Middle Muſcular, which is the *Muſculus detruſor Urinæ*, and an inner Membranous Coat, exceeding ſenſible, as is fully ſhown in the Caſes of the Stone and Gravel. The uſe of this nice Senſe is, to make it capable of that uneaſineſs which excites Animals to exclude their Water, when the Bladder is much extended. Some Anatomiſts not thinking how ſoon Fluids taken into the Stomach, and not retain'd there, by being mix'd with Solids, may paſs into the Blood, as the Effects from drinking ſtrong Liquors, or *Laudanum*, or drinking without eating, when we are hot, ſufficiently ſhow. And alſo not conſidering the ſhortneſs of the Courſe, from the Stomach to the Kidneys this way, together with the Size of the Emulgent Arteries, and the Velocity of the Blood in them, have imagined and almoſt affirmed, that there muſt be ſome immediate Courſe from the Stomach or Guts to the Bladder, not conſidering either how ſuch a Courſe would have interrupted one great end in the Animal Œconomy, or that Veſſels fit to fill the Bladder faſter than the Ureters, muſt have been too large to be conceal'd.

GLANDULÆ RENALES, are Two Glands ſeated immediately above the Kidneys, of no certain figure, nor do we know their Uſe; but always paint and deſcribe them with the Urinary Parts becauſe of their Situation. They receive a great many ſmall Arteries, and return each of 'em One or Two Veins. In their inſide is a ſmall Sinus tinctur'd with a ſooty colour'd Liquor. Tab. xiii.E. Tab. xxii.7.

The Genital Parts of Men are the *Teſtes* and *Penis*, with their Veſſels, *&c.*

The Office of the TESTES, is to ſeparate the Seed from the Blood; they are ſeated in the *Scrotum*, and are ſaid to have Four Coats, Two common, and Two proper; the common are the outer Skin and a looſe Membrane immediately underneath, call'd *Dartos*. The firſt of the proper, is the *Proceſſus Vaginalis*, it is continued from the *Peritoneum* to the Teſticle, which it incloſes with all its Veſſels. Into this Membrane, the Inteſtinum *Ileum* or Colon, deſcend in the *Hernia Inteſtinalis*, the *Omentum* in the *Hernia Omentalis*, and the Water in the *Hernia Aquoſa*. (*Vid. Muſculi Abdominis*) The other proper Coat, is the *Albuginea*, which is very ſtrong, immediately incloſing the Teſticles. The Teſticles of a Rat may be unravel'd into diſtinct Veſſels and the Texture of Tab. xxiii. A. B. C. D.

of the Teſticles of all other Animals appear to be the ſame, but they are too tender or cohere too much laterally to bear to be ſeparated.

Tab. xiii. M. Tab. xxii. 12. The TESTICLES, receive each, One Artery from the *Aorta*, a little below the Emulgents, which unlike all other Arteries, ariſe ſmall, and dilate in their progreſs, that the velocity of the Blood may be ſufficiently abated for the Secretion of ſo viſcid a Fluid as the Seed. The Tab. xxii. 13. right Teſticle returns its Vein into the *Cava*, and the left into the Emulgent Vein on the ſame ſide; both becauſe it is the readieſt Courſe, and becauſe as Authors ſay, this Spermatic Vein would have been obſtructed by the Pulſe of the *Aorta*, if it had croſs'd that Veſſel to go to the *Cava*. A Gentleman whom I Caſtrated, who truſted too much to his own Reſolution, and refus'd to have any one preſent to hold him, except Mr. *Geeke*, who was my Aſſiſtant during the Operation, moved ſo much, that the Ligature, which tied all the Veſſels with the Proceſs together, ſlipt, and only tied the Proceſs over the ends of the the Veſſels, which I perceiving, ſoon after the Operation, I cut the Ligature, and took out the Extravaſated Blood, and tied the Artery alone, which gave but little Pain, and digeſted off in a Weeks time, and the Wound being afterwards ſtitch'd, though the Teſticle weigh'd a Pound, it was perfectly well in Five Weeks; which is in leſs time than the Ligature often requires to be digeſted off, when the Proceſs and all the Veſſels are tied together. However if this Caſe is not ſufficient, to recommend doing this Operation by tying the Artery only, it may be ſufficient to recommend extraordinary care in doing of it the uſual way, for if the Blood had found an eaſy paſſage into the *Abdomen*, the Patient had bled to Death without our knowledge.

On the upper part of the Teſticles, are hard Bodies, call'd *Epididymi*; which are evidently the beginnings of the *vaſa deferentia*, I have unraveled them backward, in ſingle Veſſels, and then into more and ſmaller, like the Excretory Veſſels of other Glands. Tab. xxii. 17.

VASA DEFERENTIA, are Excretory Ducts to carry the elaborated Seed to the *Veſiculæ Seminales*. They paſs from the *Epididymi* of the Teſticles, together with the Blood Veſſels, till they have enter'd the Muſcles of the *Abdomen*, and then they paſs under the *Peritoneum*, directly through the *Pelvis*, to the *Veſiculæ Seminales*. Tab. xxii. 18.

VESICULÆ SEMINALES, are Two Bodies that appear like Veſicles, they are ſeated under the Bladder of Urine, near its Neck; they may be each of them eaſily unravell'd into one ſingle Duct, which diſcharge into the *Urethra*, by the ſides of the *Roſtrum Gallinaginis*, which is an Eminence in the underſide of the *Urethra*, near the Neck of the Bladder. In theſe Veſicles or Ducts the Seed is repoſited againſt the time of Coition; but in Dogs there are no ſuch Veſicles, therefore Nature has contriv'd a large bulb in their *Penis*, which Tab. xxii. 19. Tab. xxii. 21.

which keeps them Coupl'd, ſeemingly againſt their inclinations, 'till the Seed can arrive from the Teſticles: The Seed paſſes from theſe Veſicles in Men, and even from the *Vaſa deferentia*, in time of Coition, through the Proſtate Glands into the *Urethra*; as in thoſe Animals that have no *Veſiculæ Seminales*, for when the Ducts into the *Urethra* are diſtended, that is the directeſt Courſe from the *Vaſa deferentia*, as well as from the *Veſiculæ Seminales*.

Tab. xxii. 20. PROSTATÆ, are Two Glands, or rather One, about the ſize of a Nutmeg; they are ſeated between the *Veſiculæ Seminales* and *Penis*, under the *Oſſa Pubis*, almoſt within the *Pelvis* of the *Abdomen*. They ſeparate a lympid glutinous Humour which is carried into the *Urethra* by ſeveral Ducts, which enter near thoſe of the *Proſtatæ*; this Liquor ſeems to be deſign'd to be mix'd with the Seed in the *Urethra*, in the time of Coition, to make it flow more eaſily.

PENIS, Its Shape, Situation, and Uſe, need no Deſcription. It begins with Two Bodies, nam'd *Cruræ*, from the *Oſſa Iſchia*, which unite under the *Oſſa Pubis*, and are there ſtrongly connected. In its under part is a Channel from the Bladder, call'd *Urethra*, through which both the Urine and Seed paſs; its fore-part is call'd *Glans*, the looſe Skin which covers it, *Præputium*, and the ſtrait part of that Skin on the under ſide, *Frœnum*.

The URETHRA, is lin'd with a Membrane fill'd with ſmall Glands, that ſeparate a *Mucus*, that defends it from the Acrimony of the Urine. Theſe Glands are largeſt neareſt the Bladder. Mr. *Cowper* deſcribes Three large Glands of the *Urethra*, which he diſcover'd; Two of which are ſetled on the ſides of the *Urethra*, near the ends of the *Crura Penis*, to which he adds, a Third leſs than the other ſeated almoſt in the *Urethra*, a little nearer the Glans than the former; ll theſe Glands have Excretory Ducts into the *Urethra*.

Tab. xxii. AA.

The inner Texture of the *Penis* is ſpongy, ike the inner Texture of the Splene, or the Ends f the great Bones; it is uſually diſtinguiſh'd nto *Corpus Cavernoſum Penis*, *Glandis* and *Urethræ*; heſe Three Parts are all diſtinct, and the Two ormer divided lengthway with a thin *Septum*. ut the Cells of the *Corpora Cavernoſa Penis*, are uch larger than thoſe of the *Urethra*, or *Glans*. n the upper ſide of the *Penis*, are Two Arteries, d One Vein call'd *Vena ipſius Penis*; the Ar- eries are deriv'd from the beginnings of the Um- lical Arteries, which parts never dry up, and e Vein runs back to the Iliac Veins. The *Ve- a Ipſius Penis*, being obſtructed, the Blood that mes by the Arteries, diſtends the Cells of the hole *Penis*, and makes it Erect, but to prevent y miſchief from this Mechaniſm, there are all Collateral Veins on the ſurface of the *Pe- s*, that carry back ſome Blood all the time the

Penis is Erect. By what Power the *Vena ipſiu*
Penis is obſtructed to Erect the *Penis*, I canno
conceive, unleſs ſmall Muſcular Fibers conſtric
it. Moſt Authors think the *Muſculi Erectore*
Penis do it, by thruſting the *Penis* againſt the *O*
Pubis; but they are not ſeated, as Mr. *Cowpe*
obſerves, conveniently for ſuch an Office; beſides
if a preſſure from the Lower ſide of the *Penis*
is ſufficient, an Artificial preſſure, which may b
much greater, ſhou'd, I think, produce the ſam
effect. When the Matter of a Gonorrhea is ſo vi
rulent as to make Ulcers in the *Urethra*, whe
thoſe Ulcers Cicatriſe they conſtrict the *Urethra*
and make that difficulty in the Waters paſſing
which is vulgarly tho't to proceed from Caruncles

Tab. xxiii. E.

In the Seed of Men, and of many other Mal
Animals, *Lewenhoeck*, by the help of Micro
copes, diſcover'd an Infinite Number of Animal
like *Tadpoles*, which he and his followers ſuppoſ
to be Men in Miniature, and that one of theſ
being enter'd into an Egg in one of the *Ovaria*
(See the next Chapter.) Conception is perform'd
But though ſcarce any one, that has made due
enquiry, has ever doubted of the Exiſtance o
theſe Animals, yet there are many who object
againſt this Hypotheſis; and though I am inclin'd to think it true, yet I will endeavour impartially, to lay down the principal Objections
and Anſwers, that the Reader may Judge for himſelf. The firſt and ſtrongeſt Objection, is rais'd
from the ſeveral inſtances that have happened o

mixed Generation, where the Animal produc'd always appears to partake of both kinds, as in the common Caſe of a Mule, which is begot by an Aſs upon a Mare; when according to that Hypotheſis, they expect the Animal produc'd from mix'd Generation, ſhould be entirely of the ſame Species with the Male Animal, as the Seeds of Plants, whatever Earth they grow in, always produce Plants of the ſame kind; nevertheleſs if we conſider what influence Womens fears or longings, frequently have upon their Children in *Utero*, and how great a change Caſtration makes in the ſhape of any Animal, we cannot wonder if the Mothers Blood, to which the Animal owes its Nouriſhment and Encreaſe, from the time of Impregnation to the time of its Birth, ſhould be thought a ſufficient cauſe of Reſemblance between theſe Animals and their Mothers. Another Objection is, that Nature ſhould provide ſuch a Multiplicity of theſe Animals, when ſo few can ever be of uſe, an Animal being to be Generated of one only. To which it has been Anſwered, that in all Plants a vaſt Number of Seeds are found, though a very few of the whole that are produc'd, fall into the Earth, and produce Plants; and as in Plants the greateſt part of their Seeds are the Food of Animals, ſo the Greateſt part of the *Animalculæ*, may as well live a time to enjoy their own exiſtance, as any other Animal of as low an order. The laſt Objection is, their ſhape, which I think, will appear to have no weight, when we conſider how the Eggs of Flies produce Maggots, which grow up into Flies, and the *Tadpole* produc'd from the Egg of a Frog, grows into a form as different from a *Tadpole* as the form of a Man, and if theſe Animals had produc'd ſo few at a time, as that their young might have undergone this Change *in utero*, it is highly probable, that we ſhould not ſo much as have ſuſpected theſe analogous Changes: But how the *Animalculæ* themſelves are produc'd, is a difficult Queſtion, unleſs by Equivocal Generation, ſeeing none of them appear to be in a ſtate of encreaſe, but all of a Size.

In a Boy that dy'd of the Stone, I found a double *Ureter*, each part being dilated to an Inch Diameter; the *Pelvis* in each Kidney to twice its natural bigneſs, and the *Tubuli Urinarii*, each as large as the *Pelvis*.

In a Man that had never been cut for the Stone, I found the Ureters dilated in ſome places to Four Inches Circumference, while in ſome few ſhort ſpaces they were but little dilated, and a Stone in the Bladder leſs than a Nutmeg, which muſt have fallen in ſeveral pieces, or both Ureters could not have been dilated. From this, and other like Obſervations, I think it appears that the Prodigious Size to which the *Ureters* are uſually extended, in People who are troubled with the Stone, is owing to ſmall Stones which ſtick at the entrance into the Bladder, until the obſtructed Urine, which dilates the Ureters, can force them into the Bladder.

I have once met with a Kidney almoſt conſum'd. And once Lymphatics in a diſeas'd Teſticle, as large as a Crow-quill.

CHAP. II.

Of the Genital Parts of Women.

THE External Parts, are the *Mons Veneris*, which is that riſing of Fat cover'd with Hair above the *Rima Magna* upon the *Os Pubis*, he great doubling of the Skin on each ſide the *ima* call'd *Labia*, and within theſe a leſſer dou- Tab.xxiv.1. lling nam'd *Nymphæ*. Theſe help to cloſe up the Tab.xxiv.2. rifice of the *Vagina*: The *Nymphæ* are uſually id to ſerve to defend the *Labia* from the Urine; ut I do not ſee how the *Labia* ſtand more in eed of ſuch a defence, than the *Nymphæ* them- lves.

CLITORIS, is a ſmall Spongy Body earing ſome Analogy to the *Penis* in Men, but as no *Urethra*. It begins with Two *Crura* from e *Oſſa Iſchia*, which uniting under the *Oſſa Pu- s*, it proceeds to the upper part of the *Nym- æ*, where it ends under a ſmall doubling of in, call'd *Præputium*; the End is call'd *Glans*. Tab.xxiv.3. Tab.xxiv.4.

This is ſaid to be the chief Seat of Pleaſure i Women, as the *Glans* is in Men. (*Vid. Muſ* *Erectores Clitoridis.)*

A little lower than this, juſt within the *Vagina*, is the exit of the *Meatus Urinarius.*

Tab. xxiv. 5.
Tab. xxiv. 6.

VAGINA, is ſeated between the Bladder o Urine and the *Inteſtinum Rectum.* The Textur of it is Membranous, and its Orifice is contracted with a *Sphincter*; (*Vid. Muſc. Sphincter Vaginæ*) but the further part is capacious enough t contain the *Penis* without dilating. Near the beginning of the *Vagina*, immediately behind th Orifice of the *Meatus Urinarius*, is conſtantly found in Children, a Valve call'd *Hymen*, which looking towards the Orifice of the *Vaginæ* cloſes it in the ſame manner that the Valves o the Ventricles of the Heart, cloſe the entrance of the Ventricles; but as Children grow up, and the *Sphincter Vaginæ* grows more uſeful, this Valve is proportionably ſmaller, and in Women very rarely to be found, only ſome ſmall parts appearing in the place of this Valve call'd *Carunculæ Myrtiformes.* There have been a few inſtances in which the Edges of this growing together, it continued unperforate, until it has been neceſſary to make an inſciſion to let out the *Menſes.* The inner part of the *Vagina* is form'd into *Rugæ*, which are largeſt in thoſe who have not us'd Copulation; and leaſt in thoſe who have had many Children. Under theſe *Rugæ* are ſmall Glands, whoſe Excretory Ducts are call'd *Lacunæ*: Theſe Glands ſeparate a Mucilaginous Matter to lubricate the *Vagina*, eſpecially in Coition; and are the Seat of a *Gonorrhea* in this Sex, as the Glands in the *Urethra* are in the Male.

UTERUS, is ſeated at the end of the *Vagina*; it is about One Inch thick, Two broad, and Three long, with a very ſmall Cavity ſcarce large enough to contain the Kernel of a Hazelnutt; but in Women that have had Children a little larger. It's Orifice into the *Vagina*, is call'd *Os Tincæ*, from the reſemblance it bears to a Tench's Mouth. It has two round Ligaments which go from the ſides of it to the Groins thro' the Oblique and Tranſverſe Muſcles of the *Abdomen*, in the ſame manner as do the Seminal Veſſels in Men. This way the Gut paſſes in a *Hernia Inteſtinalis* in Women, (*Vid. Muſculi Abdominis.*) Some Authors mention *Ligamenta Lata*, which are nothing but a part of the *Peritoneum*. Near the ſides of the *Uterus* lie two Bodies call'd *Ovaria*, they are of a depreſs'd Oval Figure about half the Size of Men's Teſticles, and have ſpermatic Veſſels; they contain ſmall pellucid Eggs, from which they have their Name. There are Two Arteries and Two Veins, which paſs to and from the Ovaries or Teſtes, in the ſame manner that they do in Men; but make more windings, and the Arteries dilate more ſuddenly, in Proportion as they are ſhorter. Theſe Arteries and Veins detach Branches to the *Uterus* and Fal-

Tab. xxiv. Fig. 8.

Tab. xxiv. Fig. 7.

Tab. xxiv. Fig. 12.

Tab. xxiv. Fig. 11.

lopian Tubes, and not only make a Communication betwixt the Artery and Vein on one ſide and thoſe of the other, but alſo with the proper Veſſels of the *Uterus* detach'd from the Internal Iliac Arteries and Veins. From theſe Veſſels both Arteries and Veins in the inſide of the *Uterus*, the Menſtrual Purgations are made in Women, and ſomething of the ſame kind in Brutes, as often as they deſire Coition; one uſe of theſe Purgations is, to open the Veſſels of the *Uterus*, for the Veſſels of the *Placenta* to joyn to them. Many Authors have imagin'd that there muſt be ſome Evacuations Analogous to this, in Men, which I cannot ſee the Neceſſity of; but on the contrary, I believe that Men's not having ſuch Evacuations, is the true Reaſon why their Bodies grow Larger and Stronger than Womens. And their continuing to grow longer before they are fit for Marriage. I alſo take, to be the true Reaſon why the Supream Being creates more Males than Females in about the proportion of Thirteen to Twelve, for Women being ſooner fit for Marriage than Men, fewer will die before that Time, than of Men.

Near the ſides of the *Ovaria*, are ſeated the *Tubæ Fallopianæ*, one End of each is connected to the *Uterus*, and the ſide to the *Ovarium* by a Membrane, the other end being Jagg'd is call'd *Morſus Diaboli*, among theſe Jaggs is a ſmall Orifice which leads into the Tube, which near this End is about a quarter of an Inch in Diameter, and thence growing gradually Smaller paſſes to the

Tab. xxiv. Fig. 9

Tab. xxiv. Fig. 10.

the *Uterus* and enters there with an Orifice about the Size of a Hogs Briſtle; the Uſe of theſe Tubes is to convey the Male Seed from the *Uterus* to the *Ovaria*, to impregnate the Eggs for Conceptions; yet they are ſeemingly ſo ill adapted to this End, that many Writers have ſuppoſed there muſt be ſome other Paſſage from the *Uterus* to the *Ovaria*; but if we conſider the Caſe of Conceptions found in theſe Tubes; and the exact Analogy between theſe and the Tube of a Hen, where we have the moſt Undeniable Proof of the Seed going thro' the Tube, and of the Eggs being impregnated that way, and of the Eggs coming from the *Ovarium* through the Tube, and ſeemingly with much greater Difficulty than in Women; and beſides how frequently a matter like the Male Seed, (which I ſuppoſe is Seed,) is found in the Fallopian Tubes of Women, as I have found in Executed Bodies, and in a common Whore that Died ſuddenly; it appears almoſt certain, that the Seed goes through the Fallopian Tubes to the *Ovaria*, to impregnate Eggs which come back through the ſame Tubes to the *Uterus*. I have ſeen in a Woman both the Fallopian Tubes unperforated, which upon the Foregoing Hypotheſis, muſt have cauſed Barrenneſs, and Seed Lodg'd in theſe Tubes may have the ſame Effect, which I take to be often the Caſe of common Whores, and Women that uſe Coition too frequently; and I believe the Fat in the Membrane that connects the *Ovaria* to the Tubes, may in very Fat Women, ſo keep theſe Tubes from the *Ovaria* as to interrupt impregnations, and beſides theſe Caſes too much or too little of the Menſes, may deſtroy or interrupt Conceptions, but the latter Caſe, eſpecially in Young Women is very rare.

CHAP. III.

Of the FOETUS in UTERO.

THE *Fœtus in Utero* is involv'd in Two Coats, *viz. Chorion*, which is external, and *Amnion* which immediately incloſes the *Fœtus*. They contain a quantity of Liquor, which is a proper Medium for ſo tender a Being as the *Fœtus* to reſt in; and when the Membranes burſt at the time of Production, this Humour lubricates the *Vagina Uteri*, and renders the Birth leſs Difficult. And ſeeing the Stomach of a *Fœtus in Utero*, is always full of a Fluid like what is contain'd in the *Amnion*, and the Guts always fill'd with excrements; is it not Reaſonable to ſuppoſe that this Fluid is frequently, during the Time of geſtation, ſwallowed by the *Fœtus*, if not for Nouriſhment, at leaſt to keep theſe Parts in Uſe, and to flow through the Lacteals (as a Quantity of Blood from the Right Ventricle of the Heart, flows through the Lungs before the Birth) to keep open thoſe Paſſages 'till the Birth;

Birth, there being after that Time no other Way of receiving Nouriſhment; and are not the *Fœces* found in the Guts of a *Fœtus*, chiefly thoſe Parts of this Fluid that were taken in at the Mouth and were too groſs to enter the Lacteals?

Beſides theſe Coats, in a Cow and many other Animals, we find another Membrane call'd *Allantois*, it is incloſed by the *Chorion* together with the *Amnion*, and contains a large Quantity of Water, which it receives from the Bladder of Urine by the *Urachus*, its Uſe ſeems to be to contain the Urine that it might not by the common Paſſage be emptied into the Liquor of the *Amnion*, of which the *Fœtus*, I am inclin'd to think is frequently Drinking. Yet I own it takes off very much from the probability of the Opinion, of the *Fœtus*'s imbibing this Liquor, that, if I am rightly inform'd, ſome who have been Born with Mouths and Noſtrils unperforate, have had ſuch Fluids and Excrements in the Inteſtines that other *Fœtus*'s have, which may indeed be derived from the Salivary Glands and from the Liver, *&c.* Whether this laſt mention'd Membrane is to be found with a Human *Fœtus* or no, Anatomiſts are not agreed, and I cannot give my Opinion having never had a ſufficient Opportunity to enquire. But Children having an *Urachus* would make one expect an *Allantois*, and yet I think that would be of no Uſe, unleſs it were large enough to be undeniably diſcover'd. I have been informed by a Gentleman, whoſe probity I can ſufficiently Rely on, that he had ſeen a Child that had no External Genital Parts, and made Water through the Navel. At *Henly* upon *Thames*, there is now Living a Bargeman's Child about Ten Years Old, of which Child I had the like Account, but upon Examination I found an unperforated *Glans* with its *Frænum* immediately below the place of the Navel, and the Urine Iſſued out by Drops between this and the Belly, in the place which I ſuppoſe was the Navel, but it was ſo much Excoriated, that I could make no certain Judgment about it. In the *Uterus* of a Cow with Two Calves, I found they had but one *Chorion*, but each an *Amnion*, and *Allantois* diſtinct, but the Cotyledons which are Analogous to the *Placenta* of the Humane *Fœtus*, were pretty much in common to the Umbilical Blood Veſſels of both.

The PLACENTA, or Womb-Liver, is a Maſs of Blood-Veſſels ſeated on the outſide of the *Chorion*, being compos'd of the extream Branches, of the Umbilical-Vein and Arteries, which are for the compoſition of this Part divided into exceeding ſmall Branches to joyn a like Number of the Menſtrual Veſſels of the *Uterus*, which Veſſels of the *Uterus* are made numerous rather than large, that the ſeparation of the *Placenta* from them may not be attended with a Flux of Blood fatal to the Mother; for the Sides of little Veſſels ſoon Collapſe and Cloſe, and they are more eaſily Stopt, being Compreſs'd by the *Uterus* itſelf as it ſhrink's which it begins to do from the time of the Birth, but when the *Placenta* is ſeparated before the Delivery whether untimely or not, theſe Veſſels Bleed until the *Uterus* is diſcharged of the *Fœtus*, the Figure of the *Placenta* is circular, and its ſize as that of the *Fœtus*; being at its greateſt growth about Two Inches Thick, and Six or Seven Diameter.

The Arteries and Veins of the *Uterus* of the Mother, by which the Menſtrual Purgations are made, are joyned to the Umbilical Arteries and Veins in the *Placenta* of the *Fœtus*, the Arteries of the *Uterus* to the Veins in the *Placenta*, and the Veins in the *Uterus* to the Arteries of the *Placenta*, by theſe Veſſels a large Quantity of Blood is continually flowing from the Mother to the *Fœtus* and back again; but for what end ſuch a Quantity flows continually and back again, I cannot conceive, unleſs it is that the *Fœtus* not Breathing for itſelf, it is neceſſary that as much Blood of the Mother ſhou'd flow continually to the *Fœtus*, as can leave enough Air, or whatever our Blood receives in the Lungs for the *Fœtus*; and perhaps what Nutritious Juices the *Fœtus* receives, require a great deal of Blood to conveigh them, they being but a ſmall Part of the Blood. The Navel String or Umbilical Blood Veſſels, between the *Placenta* and the Navel are about Two Foot long, that the *Fœtus* may have room to Move without tearing the *Placenta* from the *Uterus*, which being done too ſoon, from whatever Cauſe occaſions a Miſcarriage; theſe Veſſels, *viz.* Two Arteries and One Vein twiſt about each other, particularly the Arteries about the Vein, and are contain'd in one common Coat together with a Veſſel call'd *Urachus*, which ariſes from the top of the Bladder of Urine, and ends in the *Membrane* Allantois; the Umbilical-Vein goes from the Navel directly into the Liver, and there, enters the great Trunk of the *Vena Portæ.* Near which entrance, there goes out the *Ductus Venoſus* to the great Trunk of the *Cava*, which carries part of the Blood that is brought by the Umbilical Vein, that way into the *Cava*, while the reſt circulates with the Blood in the *Porta*, the whole of it not paſſing thro' the *Ductus Venoſus* as is generally believ'd, but a great part of it into the Branches of the *Porta* in the Liver, otherwiſe there need be no Communication between the Umbilical-Vein and the *Porta*, and when the Umbilical-Vein is ſtop'd, the *Ductus Venoſus* ſoon ſhrinks and Diſappears, having no longer any Blood flowing through it, and even the *Porta* itſelf (from whence only Blood cou'd paſs after the Birth into the *Ductus Venoſus*) has leſs Blood flowing thro' it for ſome time than it had before the Birth, it receiving much Blood before the Birth from the Umbilical-Vein. After the Birth, the Umbilical-Vein becomes a Ligament, and the *Ductus Venoſus* becomes uſeleſs, contracts, and almoſt diſappears. The Blood which flows from the Mother to the *Fœtus* by the Umbilical

Tab. xxvii. Fig 1.

Tab. xxvii. Fig. 2.

Tab. xxvii. Fig. 4.

Tab. xxvii. Fig. 3.

Umbilical-Vein, is return'd (all but a ſmall Quantity, which is reſerv'd for Nutrition) by the Two Umbilical Arteries, which ariſe from the Internal Iliac Arteries, and paſſing by the outſides of the Bladder go directly to the Navel and *Placenta*, and together with theſe, there runs a ſmall Duct, call'd *Urachus*, from the Top of the Bladder thro' the Navel into the Allantois, in Brutes at leaſt. The Umbilical Arteries and *Urachus* ceaſing to be of uſe after the Birth, loſe the greateſt part of their appearance, being ſeldom to be trac'd farther than Two Inches above the Bladder, and often not ſo far.

Part of the Blood before the Birth and not the whole Quantity as is generally thought, which is brought by the Aſcending *Cava* to the right Auricle, paſſes at once through the *Foramen Ovale* into the left Auricle, and the reſt flows into the right Ventricle with the Blood of the deſcending *Cava*, and thence into the Pulmonary Artery, where about one half flows into the Lungs, and the other half directly into the *Aorta* by the *Ductus Arterioſus*, which lies between the Pulmonary Artery, and the *Aorta*, and which after the Birth is call'd *Ductus Arterioſus in Ligamentum verſus.* The better to explain this Contrivance, I will call the Quantity of Blood Flowing through the Aſcending *Cava* in a given Time Four, and that which flows through the Deſcending *Cava* Two, then let Two of the Quantity in the Aſcending *Cava* flow into the Right Auricle, it will then with the Two received from the Deſcending *Cava* have the Quantity Four, which being thrown from the right Ventricle into the Pulmonary Artery, the Quantity Two is thrown into the *Aorta* by the *Ductus Arterioſus*, and the ſame Quantity into the Lungs by the Pulmonary Branches, then the Quantity returning from the Lungs to the left Auricle, will be Two in the ſame given Time, which being added to the Two which flow'd through the *Foramen Ovale*, in the ſame Time there will be conſtantly the ſame proportions receiv'd into each Ventricle at every Diaſtole of the Ventricles as after the Birth: Now if the Blood flowing through the Aſcending *Cava* joyn'd by that from the Umbilical Vein, was but equal to that flowing through the Deſcending, let each of them be call'd Two, and let all the Blood of the Aſcending *Cava* go through the *Foramen Ovale*, then the Blood which the Left Ventricle would receive, wou'd exceed that which flows into the Right, by the whole Quantity which flows from the Lungs in the ſame time, but the Aſcending *Cava* conveighing more Blood than the Deſcending *Cava*, the Exceſs in the Left Ventricle would be greater. If the Proportions which I have taken for the eaſier computing were perfectly right, as I am ſure they are nearly, then the Quantity flowing into the Left Ventricle, wou'd be to that flowing into the Right at the ſame Time as Five to Two, if all the Aſcending Blood went through the *Foramen Ovale.*

And tho' after the Birth the Left Ventricle of theHeart is only employ'd in throwing Blood into the *Aorta*, and the Right wholly employ'd in Circulating the Blood through the Lungs, yet before the Birth all the Blood thrown out by the Left Ventricle, and about Half the Blood thrown out of the Right Ventricle, being thrown into the *Aorta*, and the other part only thro' the Lungs, it follows, that the whole force exerted by the Left Ventricle with about half that of the Right s imploy'd in throwingBlood into the *Aorta*,while hat diſtributes Blood through the whole *Fœtus* and to the Mother, but after the Birth when the Blood is to be no longer carried from the *Fœtus* to he Mother, the Left Ventricle becomes ſufficient for the Circulation thro' the *Fœtus*, and a New Occaſion immediately ariſes for that Additional Power, which before was neceſſarily employ'd in hrowing Blood into the *Aorta*, for the whole Maſs of Blood now being to be circulated thro' the Lungs, the *Ductus Arterioſus* cloſes, and the Right Ventricle muſt throw all the Blood it reeives into the Lungs, there being no longer any paſſage into the *Aorta*. It is ſuppoſed that the Ination of the Lungs at the Birth, preſently alers the poſition of the *Ductus Arterioſus*, ſo as to bſtruct it, which Account is indeed Mechanical, ut I think not true becauſe I can neither diſcern that the poſition of this Veſſel is Alter'd, nor its Surface compreſs'd: But I rather think that immediately upon the Birth, there being no Blood carried off from the *Fœtus* to the Mother, and the Left Ventricle being ſufficient to fill the *Aorta* and its Branches with Blood, as I have ſhown before, there is no longer Room for any Blood from the Right Ventricle, wherefore the Blood from the Right Ventricle will be forc'd into the Lungs, where the Paſſage is now made eaſy as I imagine by their being Inflated; and the *Ductus Arterioſus*, having the Blood no longer forced into it, ſhrinks, and in Time almoſt Diſappears: This Duct being ſtop'd, the Valve of the *Foramen Ovale* immediately ſtops that Paſſage, it being on the ſide of the Left Auricle (or that Muſcular Bag, which is the largeſt part of that Auricle) which is much the Strongeſt, muſt at all Times be preſs'd more on that Side than the other, by the Blood in the Time of the *Syſtole* of the Auricle, and it is as Evident that in the *Diaſtole* of the Auricle, there muſt be more preſſure to open that than the Right, it being a Stronger Muſcle, or elſe there could have been no Reaſon for having the Left Auricle Stronger than the Right in proportion to their Ventricles. Sometimes this Valve does not quite cover the *Foramen*, in which Caſe a ſmall Quantity of Blood may poſſibly flow from the Left Auricle to the Right, and ſo Circulate Twice through the Lungs to Once through the Body, but none could flow from the Right to the Left and eſcape the Lungs, which might be of bad Conſequence. Some have imagin'd, that Men who have this Paſſage open, cannot be Drown'd: But tho' this Paſſage has ſometimes been found open, no Man has been yet ſeen, that we have ever heard of, that cou'd not be Drown'd. I have ſeen the *Foramen* open in a Man that was Hang'd, to whom one might juſtly expect it ſhou'd have been as uſeful as in the Caſe of Submerſion. Many Writers have ſuppos'd that this *Foramen* is open in Amphibious Animals, and in ſuch Fiſh as have Two Auricles, Two Ventricles, and Lungs like Land Animals, without Gills (which in other Fiſh are Analogous to Lungs.) I have diſſected a *Porpus* which is of this kind, and found this *Foramen* clos'd; but the great Veins were vaſtly large in proportion to the Bulk of the Animal; whence I conjectured their Blood was accumulated in their Veins, while they kept under Water, and by that means that the Lungs eſcaped being oppreſs'd with Blood; which conjecture ſeem'd to me the more probable, ſince all Animals of this kind are able to abide the leaſt Time under Water, when their Blood is moſt expanded with Heat. But upon the Diſſection of an *Otter*, whoſe *Foramen Ovale* was alſo clos'd, I found the Veins nothing differing from thoſe of other Animals. In a Water *Tortoiſe* which I had an opportunity of Examining, with that moſt dextrous and indefatigable Anatomiſt, Dr. *Douglaſs*, I found the Two Ventricles of the Heart but half divided by a *Septum*, and in the beginning of the Pulmonary Artery ſeveral ſtrong Muſcular Rings, a little diſtance from each other, each of which by contracting, wou'd be capable of reſiſting a part of that Blood, which otherwiſe would have been thrown into the Lungs, when they were under Water; and this Blood ſo obſtructed muſt neceſſarily be thrown into the *Aorta*, the Two Ventricles being in a manner One common Cavity; and when they are out of the Water, this Communication of Ventricles, will ſuffer but little confuſion of the Blood which flows into the Ventricles, becauſe each Ventricle receiving and diſcharging the ſame quantity of Blood, at the ſame Times, they will Ballance each other, and thereby ſuch a mixture will be very much prevented. As a reaſon of Womens bringing forth at the Uſual Time; it has been ſaid, that at that Time, the Head of the Child begins to be ſpecifically Heavier than the reſt of the Body; and therefore muſt fall loweſt in the Fluid it lies in: Which being an uneaſy poſture, makes the Child ſtruggle, and bring on the *Labour*; but it is not true, that the Head then alters its Specific Gravity; or if it did, there is ſeldom Fluid enough in the *Amnion* for this purpoſe; and beſides, this cou'd only happen right in one poſture, and would always happen wrong in Brutes.

CHAP. IV.

Of the EYE.

THE Figure, Situation, and uſe of the Eyes, together with the Eye-brows, Eye-ıſhes, and Eye-lids, being well known, I think need only deſcribe what is uſually ſhown by iſſecting. The Orbit of the Eye, or Cavity in hich it is contain'd, is in all the vacant places ll'd with a looſe Fat, which is a proper Medium r the Eye to reſt in, and ſerves as a ſocket for it be mov'd in. In the upper and outer part this Orbit, is contain'd a large Gland, which take to be the Lacrymal Gland, notwithſtandıg it has been thought otherwiſe, becauſe rutes do not cry, at leaſt, not much, and yet ıve this Gland as large, in proportion, as Men; ıt we muſt conſider, that to yield a ſudden ofuſion of Tears, at any particular Time, is t the principal uſe of this Gland, but to furniſh all Times enough to waſh off Duſt and keep the outer Surface of the Eye oiſt, without which the *Tunica Cornea* would leſs pellucid, and the Rays of Light would diſturbed in their paſſage; and that this Liıor may be rightly diſpos'd of, we frequently oſe the Eye-lids to ſpread it equally, even hen we are not conſcious of doing it. At the inner corner of the Eye, between the Eye-lids, ſtands a Caruncle, which ſeems to be plac'd to keep that corner of the Eye-lids from being totally clos'd, that any Tears or Gummy Matter, may flow from under the Eye-lids, when we Sleep, or into the *Puncta Lacrymalia*, which are little holes, one in each Eye-lid, near this corner, to carry off into the *Ductus ad Naſum*, any ſuperfluous Tears.

The Firſt Membrane of the Eye is call'd *Conjunctiva*, it covers ſo much of the Eye as is call'd the White, and being reflected all round it lines the Two Eye-lids, it being thus return'd from the Eye to the inſide of the Eye-lids: It effectually hinders any Extraneous Bodies, from getting behind the Eye, into the Orbit, and ſmooths the parts it covers, which makes the Friction leſs between the Eye and the Eye-lids. This Coat is very full of Blood Veſſels, as appears upon any inflamation.

TUNICA SCLEROTIS, and CORNEA, make together one firm Caſe of a proper Form, for the uſe of other Coats and Humours. The fore-part of this ſtrong Coat being Tranſparent, and like Horn, is call'd *Cornea*, and the reſt *Sclerotis*. Under the *Cornea* lies the *Iris* which is an Opake Membrane, like the *Tunica Choroides*, but of different Colours in different Eyes, ſuch as the Eye appears, as Grey, Black, or Hazel, for it being ſeated under the *Tunica Cornea*, it gives ſuch an appearance to that as it has its ſelf. The middle of it is perforated for the Admiſſion of the Rays of Light, and is call'd the Pupil. Immediately under the *Iris* lie the *Proceſſus Ciliares*, like *Radial* Lines from a leſſer Circle to a greater; when theſe Proceſſes contract they dilate the Pupil to ſuffer more Rays of Light to enter into the Eye; and the contrary is done by the circular Fibres of the *Iris*, which act as a Sphincter Muſcle, but theſe Changes are not made with great Quickneſs, as appears from the Eyes being oppreſs'd with a ſtrong Light, for ſome time after we come out of a dark place, and from the contrary Effect in going ſuddenly from a Light place, to a dark one. And as the Pupil always dilates in darker places, to receive more Rays of Light, ſo when any Diſeaſe makes ſome of thoſe Rays ineffectual, which paſs through the Pupil, it dilates as in dark places to admit more Light; Therefore a dilated Pupil is a certain ſign of a bad Eye, and this may be diſcern'd uſually ſooner, then the Patient diſcerns any defect in Viſion. In Man the Pupil is round which fits him to ſee very way alike, it's alſo round in Animals hat are the Prey both of Birds and Beaſts. But Graminivorous Brutes that are too large to be he Prey of Birds, have it oblong Horizontaly, hich fits them to view a large ſpace upon the arth; while Animals of the Cat-Kind who limb Trees, and Prey indifferently on Birds r Animals that hide in the Earth; have their upils oblong the contrary way, which fits them beſt to look upward and downward at once. Beſides theſe there are other Animals whoſe Pupils are in theſe Forms, but in leſs proportions ſo as beſt to fit their ways of Life. Immediately under the *Sclerotis*, is a Membrane of little firmneſs call'd *Choroides*; in Men it is of a ruſty dark Colour, ſuch as will bury almoſt all the Rays of Light, that paſs through the *Tunica Retina*, which if it were of a brighter Colour, would reflect many of the Rays upon the *Retina*, and make a Second Image upon the firſt ſomewhat leſs, and leſs diſtinct, but both together ſtronger; which is the Caſe of Brutes of Prey, where a great part of this Coat is perfectly White, which makes them ſee Bodies of all Colours in the Night better than Men, for White reflects all Colours: But Brutes that feed only on Graſs, have the ſame parts of this Membrane of a bright Green, which enables them to ſee with leſs Light and makes Graſs, an Object that they can diſcern with greateſt ſtrength: But theſe Advantages in Brutes, neceſſarily deſtroy great accuracy in Viſion, which is of little or no Uſe to them, but to Men of great Conſequence. This Green part of the *Tunica Choroides*, in Animals that Graze, may properly be called *Membrana Uvea*, from its reſemblance in Colour, to an Unripe Grape. But in Men's Eyes, only a White Circle round the back ſide of the *Choroides* near the *Cornea*, is call'd *Uvea*.

Immediately under the *Tunica Choroides*, lies the *Tunica Retina*, which is the Optic Nerve expanded and co-extended with the *Choroides*. Rays of Light ſtriking upon this Membrane, the ſenſation is conveigh'd by the Optic Nerves, to the common *Senſorium* the Brain; theſe Nerves do not enter at the middle of the Bottom of the Eyes, but nearer the Noſe, for thoſe Rays of Light being ineffectual for viſion that fall upon the entrance of the Optic Nerves, it is fit they ſhou'd ſo enter, as that the ſame Object, or part of any Object, ſhou'd not be unperceiv'd in both Eyes, as would have been the Caſe, had they been otherwiſe inſerted; which appears from a common Experiment of part of an Object being loſt to one Eye, when we are looking towards it with the other ſhut. I know a Gentleman who having loſt one Eye by the Small-Pox, and going through a Hedge a Thorn unſeen (probably from this Cauſe) ſtruck the other and put it out. The Two Optic Nerves ſoon after they ariſe out of the Brain Joyn and ſeem perfectly united, yet from the following Caſe, I am not without ſuſpicion of their Fibres being preſerv'd diſtinct, and that the Nerve of each Eye, ariſes wholly from the oppoſite ſide of the Brain. A Soldier who was my Patient in the Hoſpital about three Years ſince, had, by a puſh with a broad Sword, his Left Eye rais'd out of the *Orbit*, which I replac'd with my Fingers, it was preſently follow'd with exceſſive Pain in the Right ſide of the Head only, and a loſs of the Senſe of Feeling and motion in both the Right Limbs, the Senſe of Feeling he recovered by degrees in about a Month, and ſoon after began to recover their Motion, but was about Twelve Months before he could walk, and lift up his Hand to his Head; and in about Two Years recovered all but the Sight of the Wounded Eye, which indeed did not appear perfect. In Fiſh theſe Nerves ariſe diſtinct from the oppoſite ſides of the Brain, and Croſs without uniting; but as theſe Animals have their Eyes ſo plac'd, as not to ſee the ſame Object with both Eyes at once, whereas Animals whoſe Optic Nerves ſeem to unite, do ſee the ſame Object with both Eyes at once, one wou'd ſuſpect that in one they were Joyn'd to make the Object not appear double, and in the other diſtinct, to make their Two Eyes (as they are to view different Objects at the ſame time) independent on each other; and yet from the following Caſes, the ſeeing Objects ſingle ſeems not to depend upon any ſuch Union, nor from the Light ſtriking upon Correſponding Fibres of the Nerves, as others have believ'd, but upon a Judgment from Experience, all Objects appearing ſingle to both Eyes in the manner we are moſt us'd to obſerve them, but in other Caſes double; for tho' we have a diſtinct Image from each Eye ſent to the Brain, yet while both theſe Images, are of an Object ſeen in one and the ſame place, we conceive of them as one, ſo when one Image appears to the Eyes (when they are diſtorted or wrong directed) in two different places it gives the *Idea* of two; and when two Bodies are ſeen in one place, as two Candles rightly plac'd, through one Hole in a Board, they appear One: But Caſes of this kind, being too numerous, I will conclude with one very remarkable, and I think much in favour of this Opinion. A Gentleman who from a Blow on the Head, had one Eye diſtorted, found every Object appear double, but by degrees the moſt familiar ones became ſingle, and in time all Objects became ſo, without any amendment of the diſtortion.

The inſide of the Eye is fill'd with Three Humours, call'd *Aqueous*, *Cryſtalline* and *Vitrious*, the *Aqueous* lies foremoſt, and ſeems to be of uſe to prevent the *Cryſtalline* from being eaſily bruis'd by rubing or a Blow, and perhaps it ſerves for the *Cryſtalline* Humour, to move forward in, while we view near Objects, and backward for remoter Objects; without which Mechaniſm or in the place of it a greater Convexity in the *Cryſtalline* Humour in the former Caſe, and a leſs Convexity in the latter, I do not imagine according to the Laws of Optics, how we could ſo diſtinctly ſee Objects at different diſtances. However it is in Land Animals, I think we may plainly ſee, that Fiſh move their *Cryſtalline* Humour, nearer the Bottom of the Eye when they are out of Water; and the Contrary way in Water, becauſe Light is leſs refracted from Water through the *Cryſtalline* Humour then from Air. Some have ſaid, that Amphibious Animals have a Membrane like the

Membrana Nictitans of Birds, which ſerves them as a *Lens* in the Water. I have examined the Eye of a *Crocodile* which Sir *Hans Sloan* keeps in Spirits, and I found this Membrane equally thick and denſe, and conſequently unfit for this purpoſe, or I believe any other except that Obvious one, of defending the Eye from the Water. Next behind the *Aqueous* Humour lies the *Cryſtalline*, its ſhape is a depreſs'd Spheroid, and it is diſtinctly contain'd in a very fine Membrane call'd *Aranea*; the Uſe of this Humour is to refract the Rays of Light which paſs through it, ſo that each pencil of Rays from the ſame point of any Object, may be united upon the *Retina* (*as in the Camera Obſcura*) to make the ſtronger impreſſion, and though by this Union of the Rays a Picture inverted is made upon the *Retina*, yet ſurely it is the Impulſe only of the Rays upon the *Retina*, that is the Cauſe of Viſion, for had the Colour of the *Retina* been black and conſequently unfit to receive ſuch a Picture, would not the Impulſe of Light upon it have been ſufficient for Viſion? Or wou'd ſuch a Picture, if it could have been made without any Impulſe, have ever conveigh'd any Senſation to the Brain? Then if the Impulſe of Light upon the *Retina* and not the Image upon the *Retina*, is the Cauſe of Viſion; When we enquire why an Image inverted in the Eye appears otherwiſe to the Mind, might we not expect to find the true Cauſe from conſidering the Directions in which the Rays ſtrike the *Retina*, as we Judge of above and below, when any Thing ſtrikes upon any part of our Bodies; nevertheleſs in viewing an Object through a *Lens*, we conceive of it as inverted, when as in receiving the Impulſes of Light in the ſame manner, and having the Picture on the *Retina* in the ſame Attitude, when we ſtand on our Heads without the *Lens*, we have not the ſame, but the Contrary Idea of the Poſition of the Object. Tho' I have conſidered this *Humour* only as a refractor of Light, yet the firſt and greateſt refraction is undoubtedly made in the *Cornea*, but it being *Concavo-convex*, like Glaſſes of that kind, while one ſide makes the Rays of Light converge, the other diverges them again, the ſame Thing alſo may be obſerved of the *Aqueous* Humour, which is indeed more concave than convex; But when the *Cryſtalline* Humour is remov'd in the couching a Cataract the *Aqueous* poſſeſſes its place, and becomes a *Lens*. In ſome Eyes either this Humour being too convex or too diſtant from the *Retina*, the Rays unite too ſoon unleſs the Object is held very near to the Eye, which fault is remediable by a concave Glaſs, as the contrary fault (common to Old Perſons) is by a convex Glaſs. Here it may not be improper to obſerve, how wiſely Providence has fix'd the Diſtance, at which we ordinarily ſee Objects beſt, for if the Eye had been form'd for a nearer View, the Object wou'd often obſtruct the

Light, and if it had been much farther, Light enough would not commonly have been produc'd from the Object to the Eye. In Fiſh the *Cryſtalline* Humour ſeems a perfect Sphere, which is neceſſary for them, becauſe Light being leſs refracted from Water thro' the *Cryſtalline* Humour than thro' Air; that defect is compenſated by a more convex *Lens*. The *Vitrious* Humour lies behind the *Cryſtalline*, and fills up the greateſt part of the Eye, its foreſide is Concave for the *Cryſtalline* Humour to lodge in, and its backſide being convex the *Tunica Retina* is ſpread over it, it ſerves as a *Medium* to keep the *Cryſtalline* Humour and the *Retina* at a due diſtance.

The larger Animals having larger Eyes, their Organs of Viſion (like a Microſcope with a large *Lens*) are fit to take in a greater View, but in that View Things are not ſo much Magnified; ſo in the Minuteſt Animals a ſmall ſpace is diſcern'd, ſuch as is their Sphere of Action, but that greatly Magnified, not realy ſo, but comparatively; for Viſion ſhews not the real Magnitude of Objects, but their proportion one to another. Fiſh have their Eyes and particularly their Pupils larger than Land Animals, becauſe there is leſs Light, (and that not ſo far diſtributed) in Water as in the Air.

CHAP. V.

Of the EAR.

THE Figure and Situation of the outer Ear, needs no Deſcription, its inner Subſtance is Cartilage, which preſerves its Form without being iable to Break: it's Uſe is to Collect Sounds, and irect them into the *Meatus Auditorius*, which is he Paſſage that leads to the Drum; this Paſſage s lin'd with a Glandular Membrane, in which lſo is ſome Hair; the *Cerumen* which is ſepe- ated by theſe Glands, being ſpread all over his Membrane, and its Hairs, ſerve to defend he Membrane from the outer Air, and to en- angle any Inſect that might otherwiſe get into he Ear. Sometimes this Wax being ſeperated n too great Quantity, it fills up the Paſſage and auſes Deafneſs; and thoſe great Diſcharges of atter from the *Meatus Auditorius*, which are ommonly call'd Impoſtumes in the Ear, I think an be nothing elſe then Ulcerations, or great ecretions from theſe Glands. At the further nd of the *Meatus Auditorius* lies the Drum, hich is extended upon a Bony Ridge almoſt ircular, its Situation in Men and Brutes is nearly

Horizontal, inclin'd towards the *Meatus Auditorius*, which is the beſt poſition to receive Sounds; the greateſt part of which being ordinarily reverberated from the Earth. In its common Situation in Men and Brutes, it is concave outward, but in Birds it's convex outward, ſo as to make the upper ſide of it nearly perpendicular to the Horizon, which ſerves them better to hear each others Sounds when they are high in the Air, where they can receive but little reverberated Sound. This Membrane does not wholly cloſe up the Paſſage, I found it once half open in a Man that I Diſſected, who had not been Deaf, and I have ſeen a Man Smoak a whole Pipe of Tobacco out thro' his Ears, which muſt go from the Mouth, thro' the *Euſtachian* Tube, and thro' the *Tympanum*, yet this Man heard perfectly well. Theſe Caſes occaſioned me to break the *Tympanum* in both Ears of a Dog, and it did not deſtroy his Hearing, but for ſome time he receiv'd ſtrong Sounds with great Horror. And that moſt Excellent Anatomiſt Mr. *St. Andre*, to whom I am greatly oblig'd in this Chapter, and whom I wiſh I had had the Happineſs to have made earlier mention of in this Treatiſe, has aſſured me, that a Patient of his had the *Tympanum* deſtroy'd by an Ulcer, and the Auditory Bones caſt out, without deſtroying his Hearing. In very young Children I have always found this Membrane cover'd with Mucous, which ſeems neceſſary to prevent Sounds from affecting them too much, there being no proviſion to ſhut the

Ears, as there is for the Eyes. A Family well known in this City, having had Four Children Born Deaf, were adviſed to lay a Bliſter upon the Heads of the next Children they might have, which they did to Three which they had afterward, and every one of them heard well; it ſeems not unreaſonable to ſuppoſe that too great a quantity of this Mucous upon the Drum, might be the cauſe of Deafneſs in the Four Children, and that the diſcharge made by the Bliſters in the latter Caſes, was the cauſe of their eſcaping the ſame misfortune.

Into the middle of the *Tympanum* is extended a ſmall Bone call'd *Malleus*, whoſe other end is articulated to a Bone call'd *Incus*, which is alſo articulated by the Intervention of an exceeding ſmall Bone call'd *Os Orbiculare*, to a Fourth Bone call'd *Stapes* : Theſe Bones are contain'd in that Cavity behind the *Tympanum*, which is call'd the Barrel of the Ear; but ſome Anatomiſts call the Barrel only *Tympanum*, and the Membrane *Membrana Tympani* : The *Malleus* being mov'd inward, by the *Muſculus Obliquus Internus*, or *Trochlearis*, it extends the *Tympanum* that it may be the more affected by the Impulſe of Sounds when they are too weak; This Muſcle ariſes from the Cartilaginous part of the *Euſtachian* Tube, and paſſing from thence in a proper Groove, it is reflected under a ſmall Proceſs, and thence paſſes on perpendicular to the *Tympanum*, to be incerted into the Handle of the *Malleus*, ſometimes with

a

a double Tendon. Parellel to this Muſcle lies another Extenſor of the *Tympanum*, call'd *Obliquus Externus*, it ariſes from the outer and upper part of the *Euſtachian* Tube, and paſſing thro' the ſame Hole, with the *Corda Tympani*, which is a Branch of the Fifth pair of Nerves, it is inſerted into a long Proceſs of the *Malleus*; this is not ſo obvious an Extenſor as to be known to be ſo, without an Experiment. The Muſcle which relaxes this Membrane is call'd *Externus Tympani*, it ariſes from the upper part of the Auditory Paſſage under the Membrane which lines that Paſſage, and is incerted into the upper Proceſs of the *Malleus*. The Relaxation of the *Tympanum* is made by this Muſcle, without our knowledge, when Sounds are too ſtrong; and as the Pupil of the Eye is contracted, when we have too much Light, and dilated where there is too little from what cauſe ſoever, ſo when Sounds are too low, or the Senſe of Hearing imperfect, from whatever cauſe, the Extenſors of the *Tympanum* ſtrech it, to make the Impulſe of Sounds more Effectual upon it, Juſt as in the Caſe of the common Drum, and the Cords of any Muſical Inſtrument. From the Cavity behind the *Tympanum*, which is call'd the Barrel of the Ear, goes the *Euſtachian* Tube, or *Iter ad Palatum*, it ends Cartilaginous behind the Palate, this Paſſage ſeems to be exactly of the ſame Uſe with the Hole, in the ſide of the common

Drum, that is to let the Air paſs in and out from the Barrel of the Ear, to make the Membrane vibrate the better, and perhaps in the Ear (which is cloſer than a common Drum) to let Air in or out as it alters in Denſity, and if any fluid ſhould be ſeparated in the Barrel of the Ear to give it a Paſſage out. This Paſſage being obſtructed as it is ſometimes by a large *Polypus* behind the *Uvula*, it cauſes great difficulty of Hearing, and ſometimes when the *Meatus Auditorius* is obſtructed, a Man opening his Mouth wide, will hear pretty well thro' this Paſſage, which is often ſo open as that Syringing Water thro' the Noſe, it ſhall paſs thro' into the Barrel of the Ear and cauſe Deafneſs for ſome time. If any one would try how well he can hear this way, let him ſtop his Ears, and take between his Teeth the End of a ſmall ſtrait Wire, or a Cord that will vibrate well, and holding the other End, ſet it a vibrating, and the Sound that he hears will be thro' this Paſſage. Dr. *Haley* in his Account of the Diving Bell ſays, that as the Air grew denſe in Diving, they felt a great Pain n their Ears, which increaſed 'till on a ſudden they heard a great *Pop* in their Ears, and were then as uddenly reliev'd from their Pain, which they never felt again at that Diving, tho' they Div'd ill they doubl'd the Denſity of the Air after that ime: But to make this agree well with the foregoing Caſes (unleſs the Paſſages were ſtop'd with ny Mucous) I know no more how, than to doubt of the Doctors Veracity, which no Man that knows him can poſſibly do. To the *Stapes* there is one Muſcle call'd *Muſculus Stapedis*, it lies in a long Channel,and ending in the *Stapes*, it ſerves to pull the *Stapes* off of the *Feneſtra Ovalis*,which otherwiſe it covers. Beſides the *Feneſtra Ovalis*, there is another near it ſomewhat leſs, call'd *Rotunda*, theſe Two Holes lead to a Cavity call'd *Veſtibulum*, which leads into other Cavities aptly call'd *Cochlea*, and Three Semicircular Canals or altogether the Labyrinth,in which are ſpread the Auditory Nerves to receive and conveigh the Impulſe of Sounds, to the common *Senſorium* the Brain. The Two Holes call'd *Feneſtra Ovalis & Rotunda*, are clos'd with a fine Membrane like the Membrane call'd the Drum,and the larger being occaſionally cover'd and uncover'd by the *Stapes*, Sounds are thereby made to influence more or leſs, as beſt ſerves for hearing, and this Advantage, being added to that of a Lax or Tenſe *Tympanum*, the Effect of Sounds may be greatly encreas'd or leſſen'd upon the Auditory Nerves, expanded in the Labyrinth. In the ſtrongeſt Sounds, the *Tympanum* may be lax, and the *Feneſtra Ovalis* cover'd, and for the loweſt the *Tympanum* Tenſe and the *Feneſtra* uncover'd. If Sounds propagated in the Air were heard leſs, we might often be in Danger before we were appriz'd of it, and if the Organs of Hearing were much more perfect, unleſs our Underſtandings were ſo too, we ſhould commonly hear more things at once than we could attend to.

CHAP. VI.

Of the Senſes of SMELLING, TASTING *and* FEELING.

THE Senſe of Smelling is made by the *Effluvia* from any Body, which are conveigh'd by the Air to the Nerves, ending in the Membranes which line the Noſe and its *Lamellæ.* In Men theſe *Lamellæ* are few, and the Paſſage thro' the Noſe not difficult, hence fewer *Effluvia* will ſtrike the Nerves, than in Animals of more exquiſite Smell, whoſe Noſes being full of *Lamellæ*, and the Paſſage for the Air Narrow and Crooked, few of the *Effluvia* eſcape one place or another, beſides their Olfactory Nerves may be more ſenſible. Fiſh tho' they have no Noſes, yet in their Mouths they may Taſte *Effluvia* in the Water, as ſurely thoſe Fiſh do, who ſeek their Prey in the darkeſt Nights, and in great Depths of Water, there being more Nerves diſpoſ'd in their Mouths, than thro' their whole Bodies beſide, the Optic excepted; and it looks as if it was done for this purpoſe; for the mere Senſe of Taſting, is ordinarily leſs curious in them, than in Land Animals; In baiting Eel Baskets, if the bait has lain long in Water, it is ſeldom taken but upon Scarifying it afreſh, which wil make it emit new *Effluvia*, it ſerves as a freſh bait.

The Senſe of Taſting is made in the like manner upon the Nerves, which line the Mouth and ſo is that of Feeling upon the Nerves, diſtributed throughout the Body; of which, I ſhou'd ſpeak largely in this place, if I had not done it already in the Chapter of the Nerves.

FINIS.

SYLLABUS,

SIVE

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- ynchondroſis.
- ynarthroſis,
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  - Gomphoſis.

Prælectio Secunda.

De Oſſium textura, Membraniſque, &c.

- N Textura ſunt obſervanda,
  - Fibræ.
  - Partes.
    - compactæ.
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SUtura
- Coronalis.
- Sagittalis.
- Lambdoidalis. —— *Oſſa Triquetra.*
- Squamoſa.
- Tranſverſalis.

Cæteræ ab Oſſibus, quæ circumagunt nominantur.

Os,

Bregmatis.

Frontis,
- Spina.
- Foramina.
- Sinus.

Ethmoides,
- Criſta Galli.
- Foramina.

Sphenoides,
- Proceſſus
  - Pterygoides
    - externus.
    - internus.
  - Innominatus.
  - Salpingoides.
  - Clinoides.
- Sella Turcica.
- Foramen
  - primum.
  - ſecundum, vel lacerum.
  - tertium.
  - quartum.
  - quintum.
- Sinus Sphenoidalis.

Temporis, { Proceſſus Mammillaris.
  Proceſſus e quo fit Os Jugale dictum.

Petroſum, { Foramen { ſextum.
    ſeptimum.
  Proceſſus Styliformis.

Meatus auditorius, &c. *Vide, de organis auditus.* Præl. xxv.

Foramen octavum.

Occipitis, { Foramen { nonum.
    decimum, vel magnum.
  Apophyſes 2.

oramina quædam Innominata.

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De Oſſibus Faciei, & Maxillarum, &c.

Os,

NASI.
Unguis, —— ductus ad Naſum.
lanum.
alæ, vel Zygoma.
lati, —— Foramina.
omer.

ongioſum & ſeptum Naſi quid.

axilla { Superior, { Alveoli.
    Foramina.
    Antrum.
  Inferior, { Proceſſus { Condyloides.
      Coronalis.
      Innominatus.
    Foramina.
    Alveoli.

S 3

- Dentes
  - Inciſorii.
  - Canini.
  - Molares.
  - Sapientiæ.

Prælectio Quinta.

De Oſſibus Trunci Corporis.

- Spina, ejus Vertebræ.
  - COLLI 7. Atlas prima. Dentata ſecunda. Proceſſ. dentatus.
    - partes anteriores ſpongioſæ.
    - Proceſſus,
      - Obliqui
        - ſuperiores.
        - inferiores.
      - Spinales bifurcati.
      - Tranſverſ. perforati.
  - Dorſi 12. Lumborum 5.
    - partes anteriores ſpongioſæ.
    - Proceſſus,
      - Obliqui
        - ſuperiores.
        - inferiores.
      - Spinales.
      - Tranſverſales.
  - Sacri 5, vel 6.
    - Spinæ.
    - Foramina.
    - Proceſſus obliqui ſuperiores.
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- Coſtæ 12.
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- Sternum
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  - Cartilago enſiformis.
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Prælectio

Prælectio Sexta.

De Oſſibus artus ſuperioris.

Os,

- CLAVICULA.
- Scapula,
  - Acetabulum.
  - Proceſſus
    - Coracoides.
    - Acromion.
  - Coſta
    - Superior.
    - Inferior.
  - Spina.
  - Baſis.
- Humeri,
  - Caput.
  - Apophyſis ſuperior.
  - Sulcus.
  - Apophyſis inferior.
    - externus,
    - internus,
  - Sinus.
- Ulna
  - Olecranon.
  - Proceſſus Styloides.
- Radius, ——— Tuberculum.
- Carpi, ordinis 4.
  - primi
  - ſecund.
- Metacarpi 4.
- Pollicis 3.
- Digitorum 12.

Prælectio Septima.

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Os,

- Innominatum,
  - ILIUM,
    - Spina.
    - Apex.
  - Iſchium —— Proceſſus
    - obtuſus.
    - acutus.
  - Pubis.
  - Acetabulum.
  - Foramen.
- Femoris,
  - Caput.
  - Trochanter
    - major.
    - minor.
  - Linea aſpera.
  - Apophyſes inferiores.
- Patella.
- Tibia, Apophyſes.
- Fibula, —— Appendix
  - ſuperior.
  - inferior.
- Tarſi 7.
  - Aſtragalus.
  - Calcaneum.
  - Cuboides.
  - Naviculare.
  - Cuneiforme
    - majus.
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De Ligamentis, & Cartilaginibus Capita oſſium inveſtientibus, & Glandulis Oſſium, juncturis inſervientibus: Etiam de his quibus Sceleton Viri, & Fœminæ Fœtus, & Adulti differunt.

De
- LIGAMENTIS in genere.
- Ligamento Terete.
- Cartilaginibus in genere.
- Glandulis juncturas lubricantibus.

ENTEROLOGIA.

Prælectio Nona.

De quibuſdam Partium externarum integumentiſque & Partibus conſtituentibus.

MAMMÆ,
- Papillæ.
- Areolæ.

Scrobiculus Cordis.
Regio Umbilicalis.
Hypochondria.
Hypogaſtrium.

Cæteræ partes externæ propriis Prælectionibus ſunt demonſtrandæ.

Cuticula.
Reticulum mucoſum.

Cutis.
- Papillæ Pyramidales. —— Ungues.
- Bulbi, unde procedunt —— Pili.

Glandulæ miliares, vel ſudoriferæ.
Membrana adipoſa.

Fibra.
Membrana.
Arteria.
Vena.
Lymphæductus.

Nervus.
Glandula.
Vas
- lacteum.
- Excretorium.

Muſculus.

Tendo.
Os.
Cartilago.
Ligamentum.

Prælectio Decima.

De Membranis totius Corporis.

DUra Mater.
Pia Mater.
Mediaſtinum.

Pleura.
Peritoneum, &c.

Prælectio Undecima.

De Glandulis ſalivalibus, earumq; ductibus.

PArotides, vel Maxillares ſuperiores.
Maxillares inferiores.
Sublinguales.
Tonſillæ.
} earum ductus.

Membrana Glandularis oris, cujus Glandulæ nominantur.
- Buccales.
- Labiales.
- Linguales.
- Fauciales.
- Palatinæ.
- Uvulares.

Prælectio Duodecima.

De Ductu Alimentali, & Membranis in Abdomine.

PEritoneum —— Vaſa Umbilicalia. *Vide* Præl. xxii.

- Omentum,
  - Ala,
    - ſuperior.
    - inferior.
  - Burſa.

Oeſophagus.

- Ventriculus, —— orificum
  - ſiniſtrum, Cardia.
  - dextrum, ubi circulus fibroſus.

- Inteſtina tenuia,
  - Duodenum.
  - Jejunum.
  - Ilium.

- Inteſtina craſſa,
  - Colon, ubi valvulæ ad ingreſſum.
  - Cæcum.
  - Rectum.

In omni parte ductus Alimentalis eſt notanda.

- Tunica
  - externa, Communis.
  - media, Muſcularis.
  - interna Glanduloſa, Villo obducta.

- In
  - Ventriculo flaccido, Rugæ.
  - Inteſtinis
    - tenuibus, Valvulæ Conniventes.
    - craſſis, Cæco excepto,
      - Ligamenta.
      - Glandulæ.
      - Valvulæ.

- Meſenterium, —— Glandulæ
  - Majores, *in Canibus Pancreas Aſellii.*
  - Minores.

In omnibus his membranis, ſunt obſervandæ Lamellæ.

Prælectio Decima Tertia.

De Hepate, Pancreate, Splene & Via lactea.

HEpar,
- Ligamentum
  - Suſpenſorium.
  - Latum.
  - Umbilicale.
- Vena
  - Porta.
  - Cava.
- Ductus Venoſus.
- Veſica Fellea.
- Vaſa excretoria,— Ductus
  - Cyſticus.
  - Hepaticus.
  - Communis.
  - Choledochus.

Pancreas —— Ductus excretorius.

Splen,
- Rete.
- Cellulæ.
- Glandulæ.

Prælectio Decima Quarta.

De quibuſdam Glandulis, & de Vaſis lacteis & Lymphaticis.

VENÆ lacteæ, generis.
- primi
- ſecundi

Receptaculum chyli.
Ductus Thoracicus.
Lymphæductus in genere.

Glandulæ
- Vaſa ubique concomitantes.
- Inguinales.
- Axillares.

Prælectio

Prælectio Decima Quinta.

De Corde, & partibus reſpirationi inſervientibus.

- Larynx, —— Cartilago
  - Thyroides.
  - Cricoides.
  - Arytænoides.
  - Epiglottis.
- Bronchos, —— Cartilagines, Pene-anulares.
- Glandulæ Thyroideæ.
- Thymus.
- Pleura.
- Mediaſtinum.
- Pulmones,
  - Lobi.
  - Lobuli.
- Pericardium.
- Cava
  - deſcendens.
  - aſcendens.
- Tuberculum Loweri.
- Cor
  - Auricula dextra
    - Columnæ.
    - Foraminis ovalis locus.
    - Oſtium Venarum coronariarum.
  - Ventriculus dexter,
    - Valvulæ tricuſpides.
    - Papillæ.
    - Columnæ.
  - Arteria Pulmonalis,
    - Valvulæ ſigmoidales.
    - Canalis arterioſus in Ligamentum verſus.
  - Vena Pulmonalis.
  - Auricula ſiniſtra, —— Columnæ.
  - Ventriculus ſiniſter,
    - Valvulæ mitrales.
    - Papillæ.
    - Columnæ.
  - Septum Cordis.
- Aorta,
  - Valvulæ ſemilunares.
  - Oſtia Arteriarum coronariarum.

Prælectio

Prælectio Decima Sexta.

De Arteriis & Venis ſuperioribus.

Arteriæ.

AOrta aſcendens.
Coronariæ Cordis.
Subclaviæ.
Thymæ.
Mammariæ.
Cervicales.
Carotides.
Thyroideæ.
Laryngeæ.
Temporales.
Occipitales.
arotides.
Ranulæ.
aciei.

Venæ.

Jugulares, { externæ, internæ.
Rami communicantes.
Ranulares.
Faciei.
Parotides.
Laryngeæ.
Thyroideæ.
Mammariæ.
Thymæ.
Occipitales.
Cervicales.
Subclaviæ.
Cava deſcendens.

Vaſa Cerebri. Vide Præl. xviii.

xillaris.
Humeralis.
ubitalis { ſuperior. media. inferior.
amus communicans.
igitales.

Digitales.
Cephalica.
Mediana.
Baſilica.
Salvatella.
Humeralis.
Axillaris.

Prælectio Decima Septima.

De Arteriis, & Venis inferioribus.

Arteriæ.

AOrta deſcendens.
Intercoſtales.
ronchiales.

Venæ.

DIgitales Pedis.
Saphæna.
Tibiales.

- Phrenicæ.
- Cœliaca.
- Pancreatica.
- Hepatica.
- Cyſtica.
- Coronaria Ventriculi ſuper.
- Epiploicæ.
- Splenica.
- Coronaria Ventriculi infer.
- Meſenterica ſuperior.
- Emulgentes.
- Spermaticæ.
- Lumbares.
- Meſenterica inferior.
- Rami communicantes.
- Sacra.
- Iliaca
  - externa.
  - interna.
- Epigaſtricæ.
- Cruralis.
- Tibialis
  - anterior.
  - media.
  - poſterior.
- Ramus communicans.
- Digitales Pedis.

- Popliteæ.
- Cruralis.
- Epigaſtricæ.
- Iliaca
  - externa.
  - interna.
- Lumbares.
- Spermaticæ.
- Emulgentes.
- Meſeraicæ.
- Coronaria Ventriculi infer.
- Splenica.
- Epiploicæ.
- Coronaria Ventriculi ſuper.
- Cyſtica.
- Hepatica.
- Pancreatica.
- Porta.
- Phrenicæ.
- Intercoſtales.
- Bronchiæ.
- Azygos in Cavam deſcendentem.
- Cava aſcendens.
- Earum Valvæ.

Tunicæ, & Vaſa Vaſorum.

Prælectio Decima Octava.

De Cerebro, ejuſque Membranis, & Vaſis.

Dura Mater
- Proceſſus
  - primus, (*i. e.*) Falx.
  - ſecundus.
  - tertius.
- Sinus
  - Longitudinalis
    - ſup.
    - inf.
  - Laterales.
  - Rectus.
  - Circularis.
  - Innominata.
  - ubi Ligamenta. Torcular Herophili.

Cæteri non ſunt ſemper obſervandi.

Pia Mater
- Arteriæ.
- Venæ.
- Volvuli.

Cerebrum.
- Hemiſpheria 2.
- Lobi 4.
- Arteriæ
  - Carotides.
  - Cervicales.
- Infundibulum.
- Glandula pituitaria.
- Protuberantiæ 2 albæ pone infundibulum.
- Medulla oblongata,
  - Crura.
  - Caudex.
  - Protuberantia annularis.
- Nervorum par
  - 1, 2, 3, 4, 5 ſeu
    - Olfactorium.
    - Opticum.
    - Oculorum motorium.
    - Patheticum.
    - Guſtatorium.
  - 6 unde Rami intercoſtales.
  - 7, 8 ſeu
    - Auditorium.
  - 9, 10
    - vagum, - Nervus
      - Acceſſorius.
      - Recurrens.

Cerebellum, —— Proceſſus vermiformes.

Subſtantia
- Corticalis cinerea.
- Medullaris alba.

Septum lucidum.

Fornix,
- Radices.
- Crura.

Ventriculi 2 anteriores,
- Plexus Choroides.
- Glandula Pinealis.
- Corpora ſtriata.
- Thalami Nervorum opticorum.
- Nates.
- Teſtes.

Foramen
- ad Radices Fornicis.
- anterius.
- poſterius.

Ventriculus tertius.

Ventriculus quartus.
- Valvula.
- Pedunculi.

Quod de Cerebro ſupereſt notatu indignum judico.

Prælectio Decima Nona.

De Medulla Spinali & Nervis paſſim in Corpus diſperſis.

Medulla Spinalis
- Meninges.
- Cauda Equina.
- Nervor; pares
  - Cervicis 7.
  - Dorſi 12.
  - Lumborum 5.
  - Sacri 6.

Brachiales.
Cubitales.

Digitales.
Intercoſtales.

Cruralis { anticus.
poſticus.

Tibiales.
Digitorum pedis.

Sunt plurimi ex his oriundi, & per Corpus undique diſperſi. Et a partibus quibus Subſerviunt nominantur.

Prælectio Vigeſima.

De Partibus Urinariis, & Organis generationis in Viris.

Renes, { Arteriæ } emulgentes.
Venæ }
Glandulæ.
Papillæ.
Tubuli Urinarii.
Pelvis.

Glandulæ Renales. —— Sinus.
Ureteres.

Veſica urinaria,--- Tunica { Externa communis.
Media, *Muſculus detruſor urinæ.*
Interna.

Muſculus Sphincter Veſicæ.

- Teſtes,
  - Tunicæ
    - Communes,
      - externa, Cutis.
      - interna, Dartos.
    - Propriæ
      - externa, Proceſſus Elythroides.
      - interna, Albuginea.
  - Arteriæ } Spermaticæ.
  - Venæ } Spermaticæ.
  - Corpora varicoſa.
  - Epididymes.
- Vaſa deferentia.
- Veſiculæ ſeminales.
- Proſtatæ.
- Penis,
  - Glans,
    - Præputium.
    - Frœnum.
    - Corpora cavernoſa.
    - Glandulæ odoriferæ.
  - Crura.
  - Corpora cavernoſa.
  - Septum.
  - *Connexio ad Oſſa pubis, vulgo Ligamentum ſuſpenſorium.*
  - Urethra.
    - Corpus cavernoſum.
    - Roſtra Gallinaginis.
    - Membrana Glanduloſa.

Muſculi : *Vide* Præl. xxvi.

Prælectio Vigeſima Prima.

De Partibus Generationis Mulierum.

Externæ,
- Mons Veneris.
- Rima Magna.
- Labia.
- Nymphæ.
- Clitoris,
  - Glans.
  - Præputium.
  - Crura.
  - Corpora cavernoſa.
- Meatus Urinarii exitus.

Vagina,
- Hymen.
- Carunculæ myrtiformes.
- Rugæ.
- Glandulæ.
- Lacunæ.

Uterus,
- Ligamenta.
- Os Tincæ.

Tubæ Faloppianæ,
- Fimbriæ.
- Foramina.

Teſticuli
- Arteriæ
- Venæ ſpermaticæ.
- Corpora varicoſa.
- Ova.

Prælectio Vigeſima Secunda.

De Fœtu in Utero, cum Membranis, &c.

Membrana
- Chorion.
- Allantois.
- Amnion.

Humores.
Placenta Uterina.
- Vaſa Umbilicalia,
  - Vena.
  - Arteriæ.
  - Urachus.

Foramen ovale.
Ductus arterioſus.

Prælectio Vigeſima Tertia.

De Organis Tactus, Guſtus, & Odoratus.

Tactus.

PApillæ pyramidales in Cute. *Vide Præl.* ix.

Guſtus.

Papillæ pyramidales in Lingua.

Odoratus.

Membrana Glanduloſa, & Nervea, paſſim inducta in Laminas Naſi, commune Os ſpongioſum dictum.

Prælectio Vigeſima Quarta.

De Organis Viſus.

PAlpebræ cum Ciliis, & Superciliis.
Caruncula lachrymalis.

Tunicæ

Conjunctiva.
Sclerotis.
Cornea.
Tunica Choroides.
Uvea.
Retina.
Aranea.
Proceſſus Ciliares.
Iris.
Pupilla.
Aqueus.
Humores, Vitreus.
Cryſtallinus.

Prælectio Vigeſima Quinta.

De Organis Auditus.

AURICULA,
Méatus Auditorius.—— Membrana Glanduloſa.
ter ad Palatum.
Tympanum.
Membrana Tympani.
Feneſtra ovalis.
rotunda.
Veſtibulum.
Labyrinthus. Cochlea.
Canales tres ſemicirculares.
Incus.
Stapes.
Oſſa, Malleolus.
Oſſiculum quartum.
externus. Tympani, —— laxatores.
obliquus.
Muſculus internus, —— Tympani, tenſor.
ſtapidis.

MYOLOGIA.

Prælectio Vigeſima Sexta.

De Muſculis Abdominis, &c.

FASCIA tendinoſa, *vulgo Membrana communis Muſculorum.*
Membrana propria.

Abdominis.

Obliqui { deſcendentes.
aſcendentes.
Pyramidales, —— *ſæpe deſunt* } Compreſſores.
Recti, —— flexores.
Tranſverſales.
Cremaſteres Teſtium.
Erectores Penis.
Acceleratores urinæ.
Erectores Clitoridis.
Sphincter Vaginæ.
Sphincter ani.
Levatores ani.

Prælectio Vigeſima Septima.

De Muſculis Faciei, Oculi, &c.

Frontis.

OCCIPITO-FRONTALIS.
Retractor Auriculæ.

Palpebrarum.

Orbicularis.
Ciliaris, *eſt portio prioris.*
Aperiens Palpebram ſuperiorem rectus.

Oculi.

Elevator.
Depreſſor.
Adductor.
Abductor.
Obliquus { ſuperior, ſeu Trochlearis.
Obliquus { inferior.

Faciei.

Sphincter Oris.
Elevator } Labii ſuperioris proprius eſt
Depreſſor } Labii ſuperioris proprius eſt
Dilatator } alarum Naſi.
Conſtrictor } alarum Naſi.
Elevator } Labi inferioris, proprius.
Depreſſor } Labi inferioris, proprius.
Elevator } Labiorum communis.
Depreſſor } Labiorum communis.
Zygomaticus.
Buccinator.
Platyſma Myoides.

Prælectio Vigeſima Octava.

De Muſculis Oſſis Hyoidis, Linguæ, & Laryngis.

Oſſis Hyoides.

MYLOHYOIDEI, }
Geniohyoidei, } ſurſum antrorſumque.
Stylohyoidei, —— ſurſum, retrorſumque.
Coracohyoidei, —— deorſum, retrorſumque.
Sternohyoidei, —— deorſum.

Linguæ.

Geniogloſſi, —— ſurſum, antrorſumque.
Stylogloſſi, —— ſurſum, retrorſumque.
Ceratogloſſi, —— deorſum.

Laryngis.

Hyothyroidei, —— Elevatores }
Sternothyroidei, } depreſſores. } Thyroidis.
Cricothyroidei, }

Cricoarytœnoidei, { poſtici, } apertores }
{ laterales, } } Arytœnoidis.

Thyroarytœnoidei, }
Arytœnoidei, } clauſores.

Prælectio Vigeſima Nona.

e *Muſculis Maxillæ inferioris, Pharyngis, & Uvulæ.*

Maxillæ inferioris.

Igaſtricus, — depreſſor.

aſſeteres,
emporales,
erygoidei { externi, interni, } elevatores.

Pharyngis.

ylopharyngei, — dilatores.
Eſophagei, — conſtrictores.
aginalis Gulæ.

Uvulæ.

erygoſtaphylini { externi, — deorſum.
interni, — ſurſum.

Prælectio Trigeſima.

e *Muſculis Claviculæ, Scapulæ, Humeri, & Cubiti.*

Claviculæ.

UBCLAVIUS.

Scapulæ.

rapezius — retrorſum.
levator.
homboides, ſurſum, retrorſumque.

Serratus { major } anticus, { antrorſum, ſurſumque.
minor } antrorſum, deorſumque.

Pectoralis, —— antrorſum.

Deltoides, } ſurſum.
Supraſpinalis, }

Infraſpinalis. }
Teres { major. } retrodeorſum.
minor *eſt por. Muſc. infraſp.* }
Latiſſimus Dorſi. }

Coracobrachialis, —— ſurſum, extrorſumque.
Subſcapularis, —— introrſum.

Cubiti.

Biceps, } Flexores.
Brachialis, }

Triceps, } Extenſores.
Anconeus, }

Prælectio Trigeſima Prima.

De Muſculis Volæ Manus, Carpi, Pollicis, Digitorum, & Radii.

Volæ Manus.

PAlmaris { longus, *ſæpe deeſt.*
brevis, ſeu caro quadrata.

Carpi.

Flexor { Radialis.
Ulnaris.

Extenſor { Radialis, ſeu Bicornis.
Ulnaris.

Pollicis.

primi
tenſor ſecundi internodii.
tertii

exor primi, & ſecundi Oſſis.
tertii internodii.

ductor.

ductor.

Digitorum.

rforatus, — ſecundi
rforans, — tertii internodii flexor.
mbricales, — primi

Communis.
xtenſor Indicis.
Auricularis.

bductor primi digiti.
minimi

teroſſei, — extenſores, & divaricatores.

Radii.

pinator longus.
brevis.

onator teres.
quadratus.

Prælectio

Prælectio Trigeſima Secunda.

De Muſculis Capitis, & Colli.

Capitis.

MASTOIDEI,
Recti { interni { majores } flexores.
minores
laterales —— utrinque.

Colli.

Longi, —— flexores.
Scaleni.
Intertranſverſales.

Capitis.

Splenii.
Complexi.
Recti { majores. } extenſores.
minores.
Obliqui { ſuperiores.
inferiores. —— rotatores.

Colli.

Spinales.
Tranſverſales. } extenſores.
Interſpinales.

Prælectio Trigeſima Tertia.

De Muſculis Dorſi, Lumborum, & Coſtarum.

Dorſi.

SACROLUMBALES.
Longiſſimi. } extenſores.
Semiſpinales.

Lumborum.

Pſoæ parvæ, — flexores, *ſæpe deſunt.*
Quadrati, — utrinque.
Coccygei.

Coſtarum.

Serrati { ſuperiores, } poſtici { levatores.
inferiores, depreſſores.

Intercoſtales { externi, } levatores.
interni,

Triangulares, } conſtrictores.
Diaphragma,

Prælectio Trigeſima Quarta.

De Muſculis Femoris, & Tibiæ.

Femoris.

PSOA magna, } flexores.
Iliacus internus,
Pectineus,
Triceps,

Gluteus { maximus, } extenſores.
medius,
minimus,

Pyriformis, } ſeu { Iliacus externus. } rotatores.
Marſupialis, Obturator internus.
Quadratus.
Obturator internus.

Tibiæ.

Membranoſus, —— extenſor extrorſum.

Sartorius, } flexor introrſumque.
Graciliis,

Semitendinoſus, } flexores.
Semimembranoſus,
Biceps,
Popliteus,

Rectus.
Vaſtus { externus,
internus, } extenſores.
Crureus.

Prælectio Trigeſima Quinta.

De Muſculis Tarſi, Pollicis, & Digitorum Pedis.

Tarſi Muſculi.

GASTROCNEMIUS externus,
Plantaris, *ſæpe deeſt* } extenſores.
Gaſtrocnemius internus,

Tibialis { anticus, —— flexor
poſticus, —— extenſor } introrſum.

Peroneus { longus,
brevis, } extenſores extrorſum.

Pollicis Pedis.

Extenſor { longus.
brevis.

Flexor { longus.
brevis.

Abductor
Adductor } *ſunt Flexores.*

Digitorum Pedis.

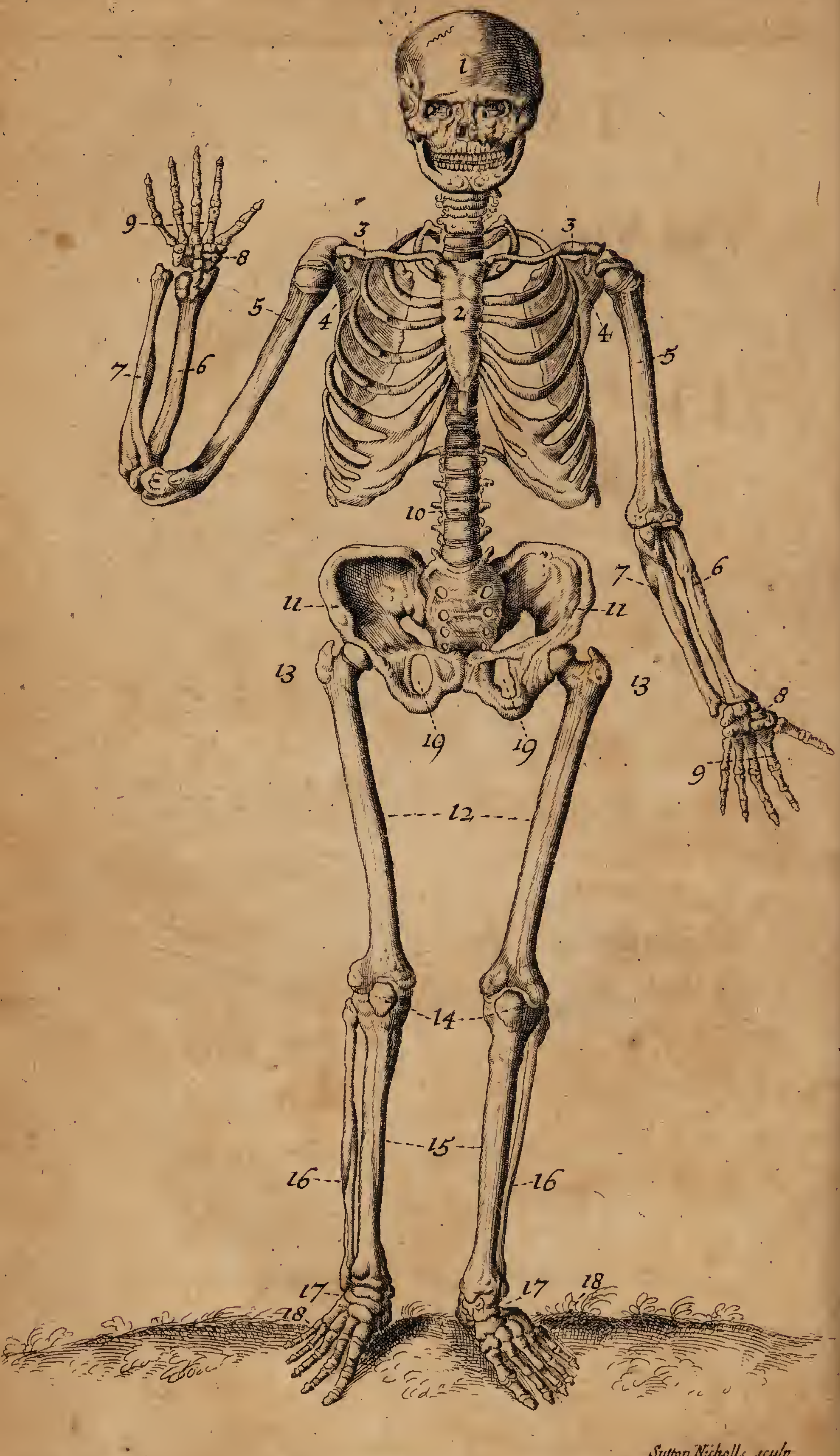
Extenſor { longus.
brevis.

Interoſſei, —— extenſores.

Perforatus, —— ſecundi
Perforans, —— tertii } internodii Flexores.
Lumbricales, —— primi

Tranſverſalis Pedis —— conſtrictor.

FINIS.



Sutton Nicholls sculp

TABLE I.

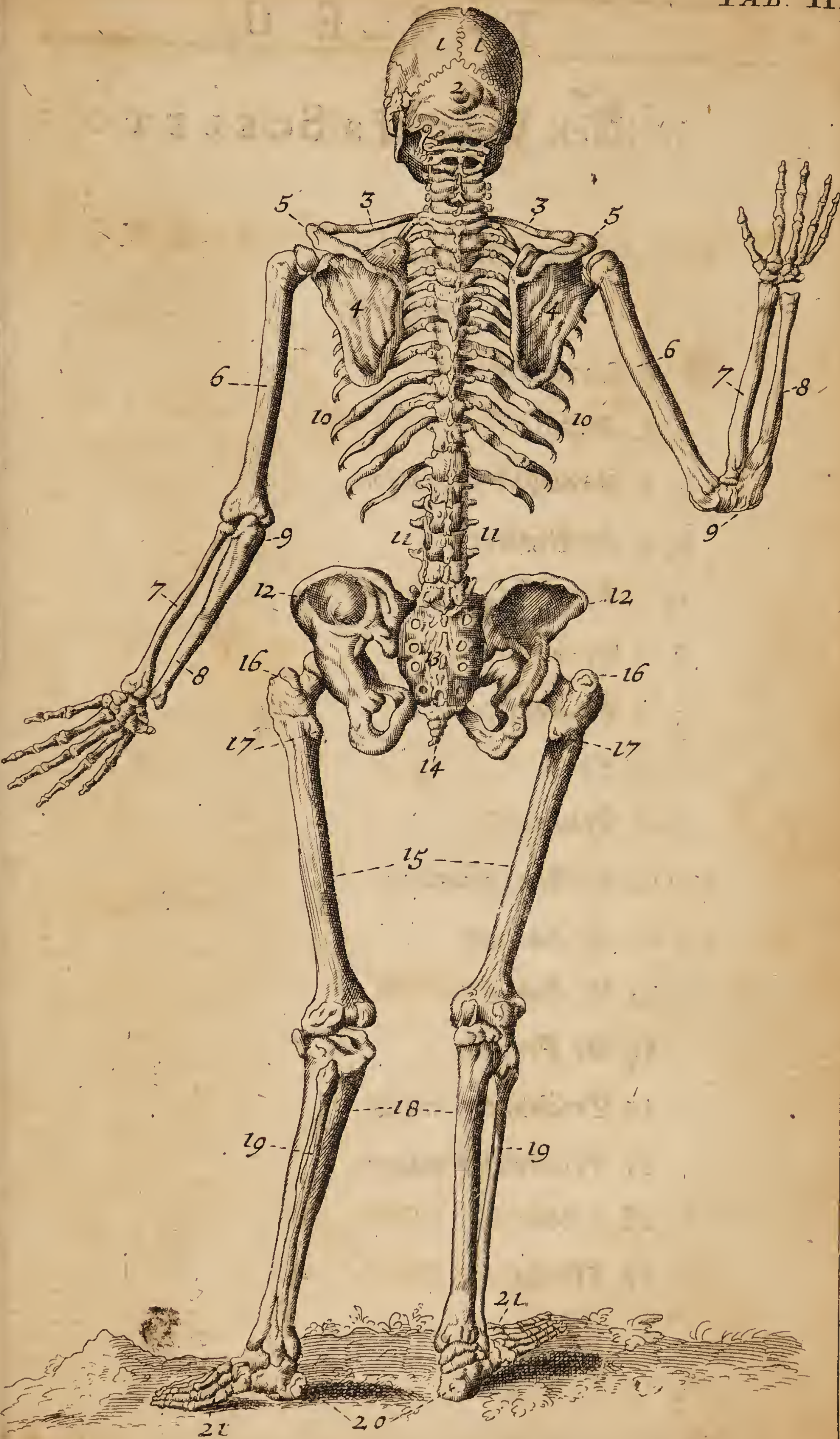
The Fore View of a SCELETON.

1 *OS Frontis.*
2 *Oſſa Pectoris.*
3, 3 *Clavicula.*
4, 4 *Scapula.*
5, 5 *Os Humeri.*
6, 6 *Radius.*
7, 7 *Ulna.*
8, 8 *Carpus.*
9, 9 *Metacarpus.*
10 *Spina Dorſi.*
11, 11 *Os Innominatum.*
12 *Os Femoris.*
13, 13 *Trochanter Major.*
14 *Patella.*
15 *Tibia.*
16, 16 *Fibula.*
17, 17 *Tarſus.*
18, 18 *Metatarſus.*

TABLE II.

The Back View of a SCELETON.

1, 1 OS *Bregmatis.*
2 *Os Occipitis.*
3, 3 *Clavicula.*
4, 4 *Scapula.*
5, 5 *Processus Acromion.*
6, 6 *Os Humeri.*
7, 7 *Radius.*
8, 8 *Ulna.*
9, 9 *Olecranon.*
10, 10 *Costæ.*
11, 11 *Spina.*
12, 12 *Os Innominatum.*
13 *Os Sacrum.*
14 *Os Coccygis.*
15 *Os Femoris.*
16, 16 *Trochanter major.*
17, 17 *Trochanter minor.*
18 *Tibia.*
19, 19 *Fibula.*



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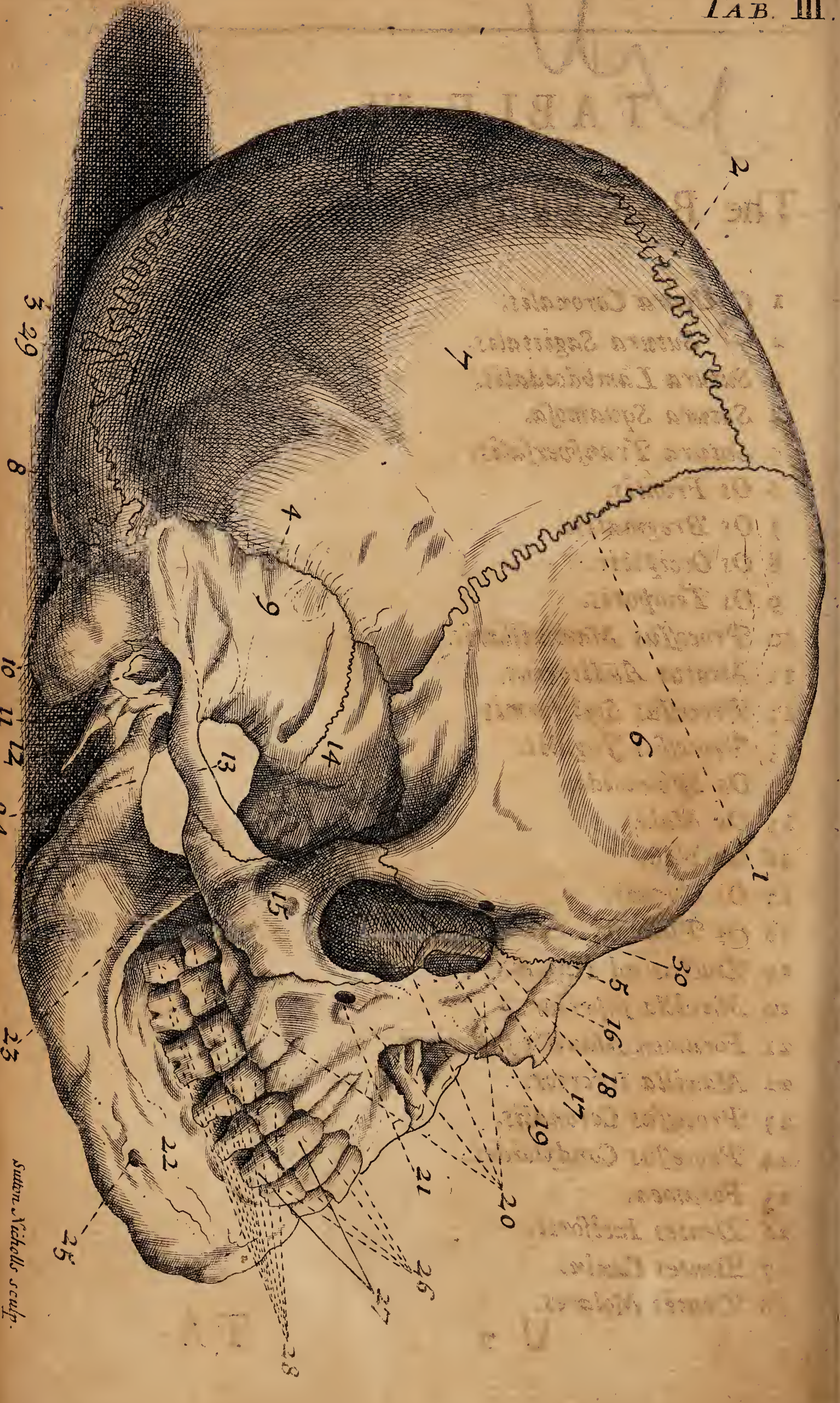


Sutton Nicholls sculp.

TABLE III.

The BONES of the HEAD.

1 *SUtura Coronalis.*
2 *Sutura Sagittalis.*
3 *Sutura Lambdoidalis.*
4 *Sutura Squamoſa.*
5 *Sutura Tranſverſalis.*
6 *Os Frontis.*
7 *Os Bregmatis.*
8 *Os Occipitis.*
9 *Os Temporis.*
10 *Proceſſus Mammillaris.*
11 *Meatus Auditorius.*
12 *Proceſſus Styliformis.*
13 *Proceſſus Jugalis.*
14 *Os Sphænoides.*
15 *Os Malæ.*
16 *Os Naſi.*
17 *Os Unguis.*
18 *Os Planum.*
19 *Ductus ad Naſum.*
20 *Maxilla ſuperior.*
21 *Foramen Maxillæ ſuperioris.*
22 *Maxilla inferior.*
23 *Proceſſus Coronalis.*
24 *Proceſſus Condyloides.*
25 *Foramen.*
26 *Dentes Inciſorii.*
27 *Dentes Canini.*
28 *Dentes Molares.*

TABLE IV.

A, The Fore View of the SCULL.

1, 1 *Sutura Coronalis.*
2 *Sutura Sagittalis.*
3 *Sutura Squamoſa.*
4 *Sutura Sphænoidalis.*
5 *Os Frontis.*
6, 6 *Os Bregmatis.*
7, 7 *Os Malæ.*
8, 8 *Os Naſi.*
9 *Maxilla ſuperior.*

B, A View of the *Baſis* of the SCULL.

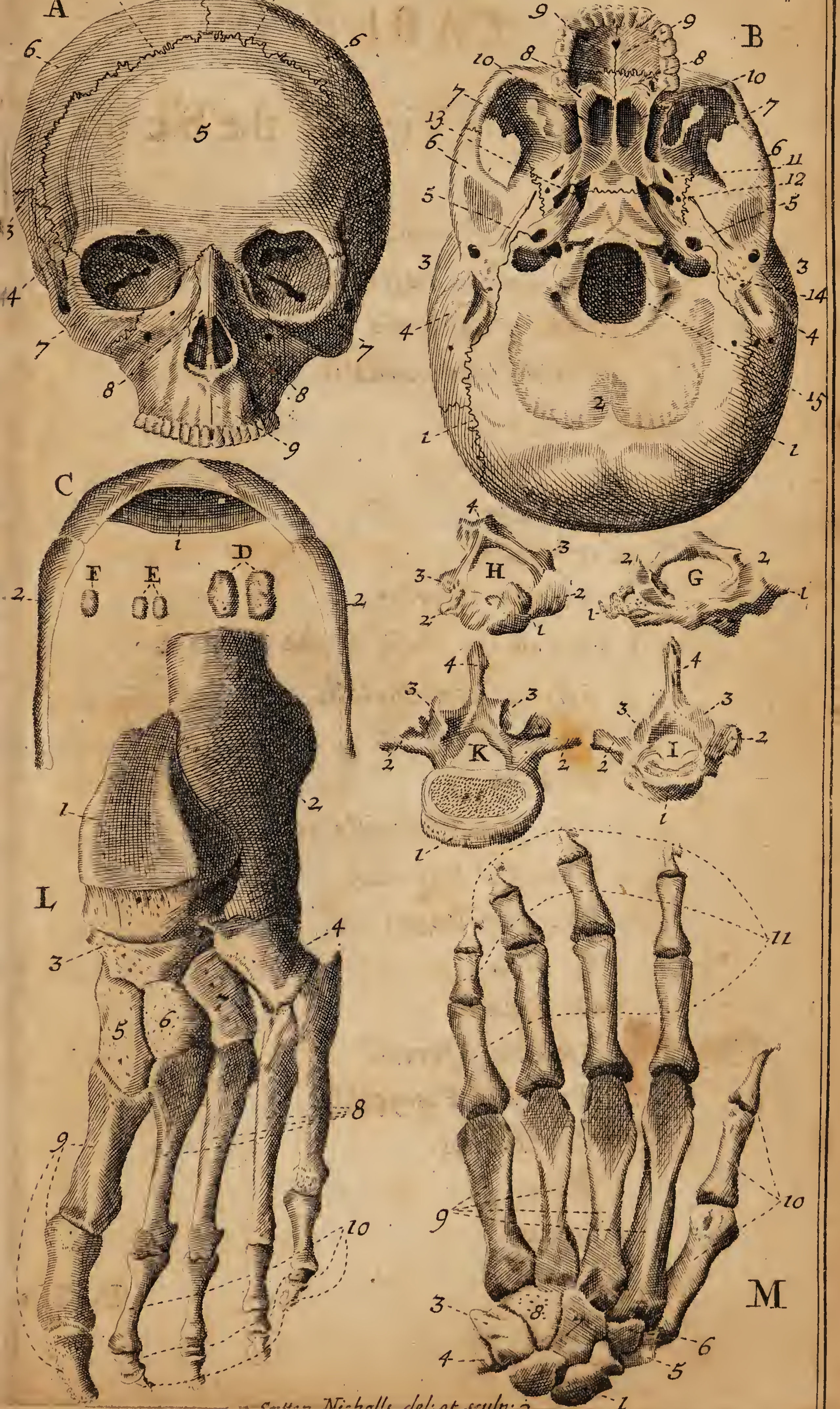
1, 1 *Sutura Lambdoidalis.*
2 *Os Occipitis.*
3, 3 *Os Temporis.*
4, 4 *Proceſſus Mammillaris.*
5, 5 *Proceſſus Styloides.*
6, 6 *Proceſſus Jugalis.*
7, 7 *Os Malæ.*
8, 8 *Os Palati.*
9, 9 *Maxilla ſuperior.*
10, 10 *Proceſſus Pterygoides.*

C, The *Os Hyoides.*

1 *Baſis.*
2, 2 *Cornua.*

D, The

TAB. IIII.



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D, The *Oſſa Seſamoidea* of the Great Toe.

E, The *Oſſa Seſamoidea* of the Thumb.

F, A Seſamoid Bone that I found near the beginning of the *Plantaris*-Muſcle.

G, The firſt *Vertebra.*

1, 1 *Proceſſus Tranſverſus.*

2, 2 *Proceſſus Obliquus.*

H, The ſecond *Vertebra.*

1 *Proceſſus Dentatus.*

2, 2 *Proceſſus Tranſverſus.*

3, 3 *Proceſſus Obliquus.*

4 *Proceſſus Spinalis.*

I, One of the *Vertebræ* of the *Thorax.*

1 *Corpus Spongioſum.*

2, 2 *Proceſſus Tranſverſus.*

3, 3 *Proceſſus Obliquus.*

4 *Proceſſus Spinalis.*

K, One of the *Vertebræ* of the Loins.

1 *Corpus Spongioſum.*

2, 2 *Proceſſus Tranſverſus.*

3, 3 *Proceſſus Obliquus.*

4 *Proceſſus Spinalis.*

L, The Bones of the Foot.

1 *Aſtragalus.*

2 *Os Calcis.*

3 *Os Naviculare.*

4 *Os Cuboides.*

5 *Os Cuneiforme majus.*

6 *Os Cuneiforme medium.*

7 *Os Cuneiforme minimum.*

8 *Metatarſus.*

9 *Oſſa Pollicis Pedis.*

10 *Oſſa Digitorum Pedis.*

M, The Bones of the Hand.

1, 2, 3, 4, 5, 6, 7, 8. The Eight Bones of the *Carpus.*

9 *Metacarpus.*

10 The Bones of the Thumb.

11 The Bones of the Fingers.

TAB. V.

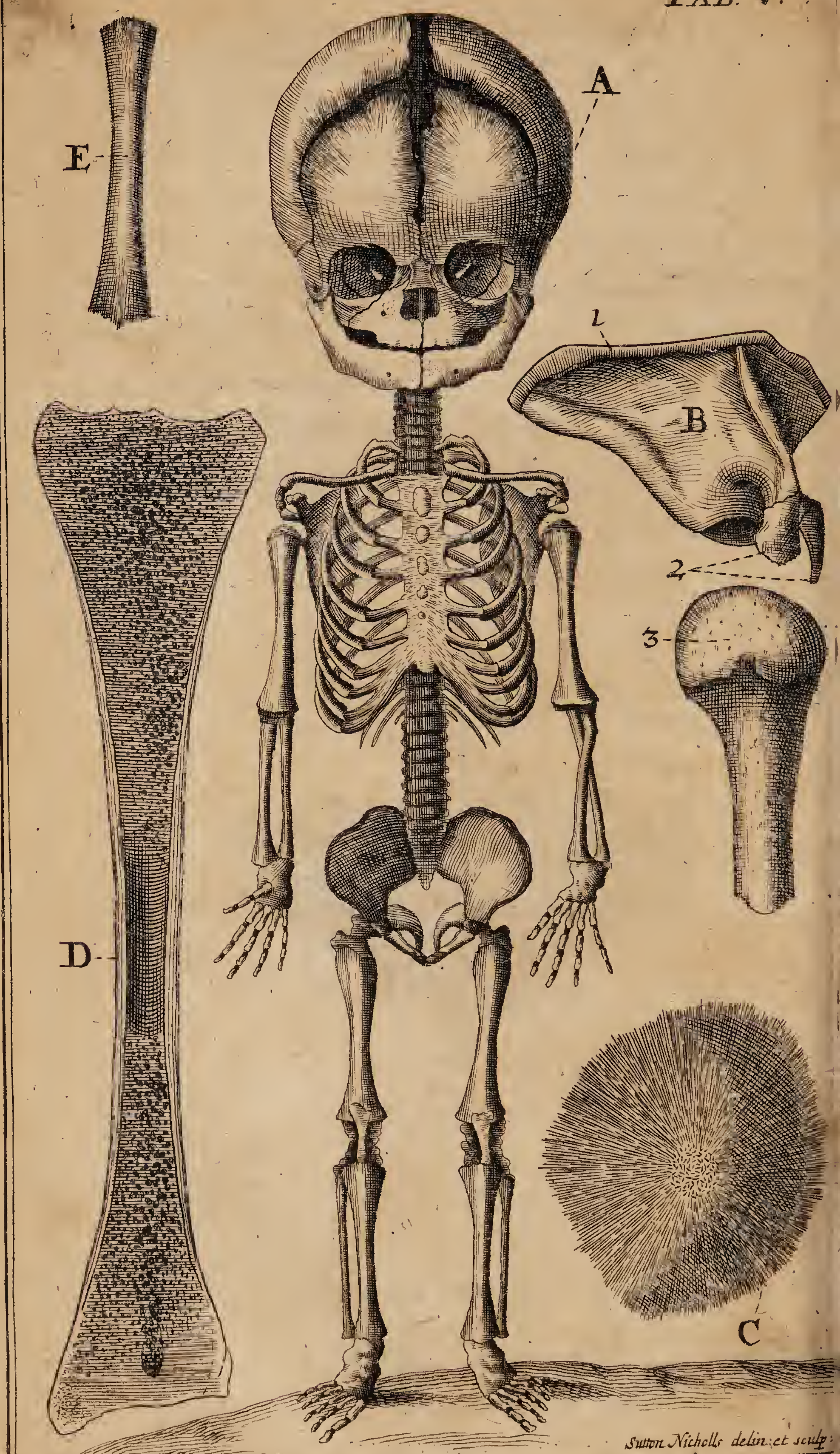

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TABLE V.

A, SHEWS the SCELETON of a full grown *Fœtus*, in which may be obſerv'd, the *Epiphyſes*, the *Carpus* and *Tarſus*, which are Cartilaginous, (ſhrunk in drying) and the ſhape in general differing from the SCELETON of an Adult.

B, The *Scapula* of a Body Twelve Years old.

1 An *Epiphyſis* at the *Baſis*.

2 The *Epiphyſis* of its *Proceſſes*.

3 The *Epiphyſis* at the upper End of rhe *Os Humeri* from the ſame Body.

C, The *Bregma* of a *Fœtus* Five Months old prepar'd, to ſhew the Fibres Oſſifying from a middle Point, and ſhooting out on every ſide.

D, The *Tibia* ſaw'd length ways.

E, The *Tibia* of a *Fœtus* Five Months old. with with the *Epiphyſes* off.

TABLE VI.

A, A Diſtorted Spine.

B, The *Os Femoris* of a Man Eight Foot high.

1 Shows Three *Trochanters.*
2 A Fourth *Trochanter.*
3 The *Linea Aſpera.*
4 The Two inferior *Apophyſes.*

C, Part of an *Os Femoris* Carious.

D, Half the Lower-Jaw exfoliated, By Mr. MAURICE BERKLY.

E, Part of a Carious Leg and Foot, with all the Bones grown into One.

1 The *Tibia.*
2 The *Fibula.*

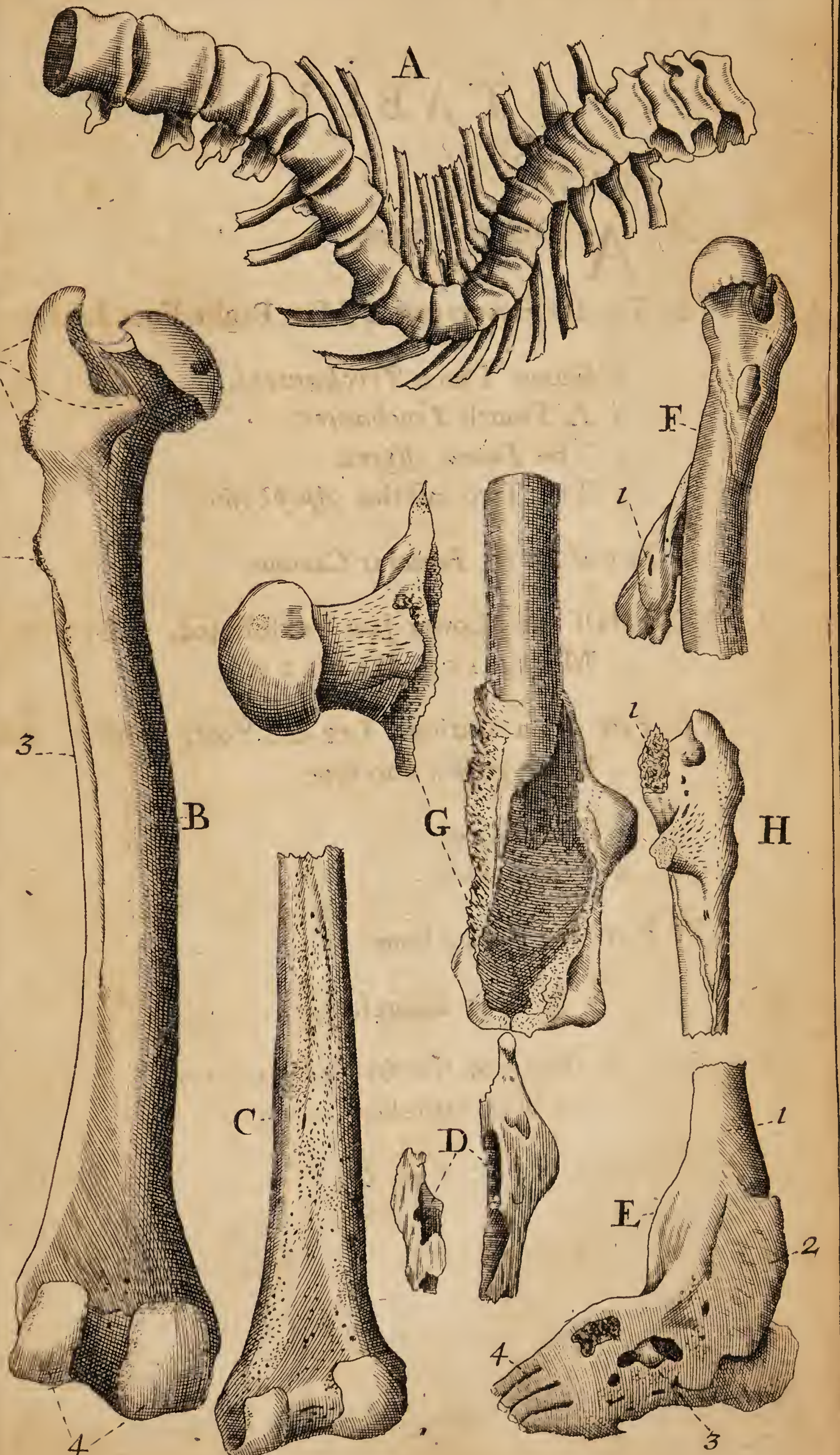
F, Part of a Thigh-bone.

1 A Bony Excreſcence.

G, The Head of the *Os Femoris* broke off, which had been miſtaken for a Luxation.

H, Another piece of an *Os Femoris* with the Head broke off; which had alſo been miſtaken for a Luxation.

Tab. VI.



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TAB. VII.

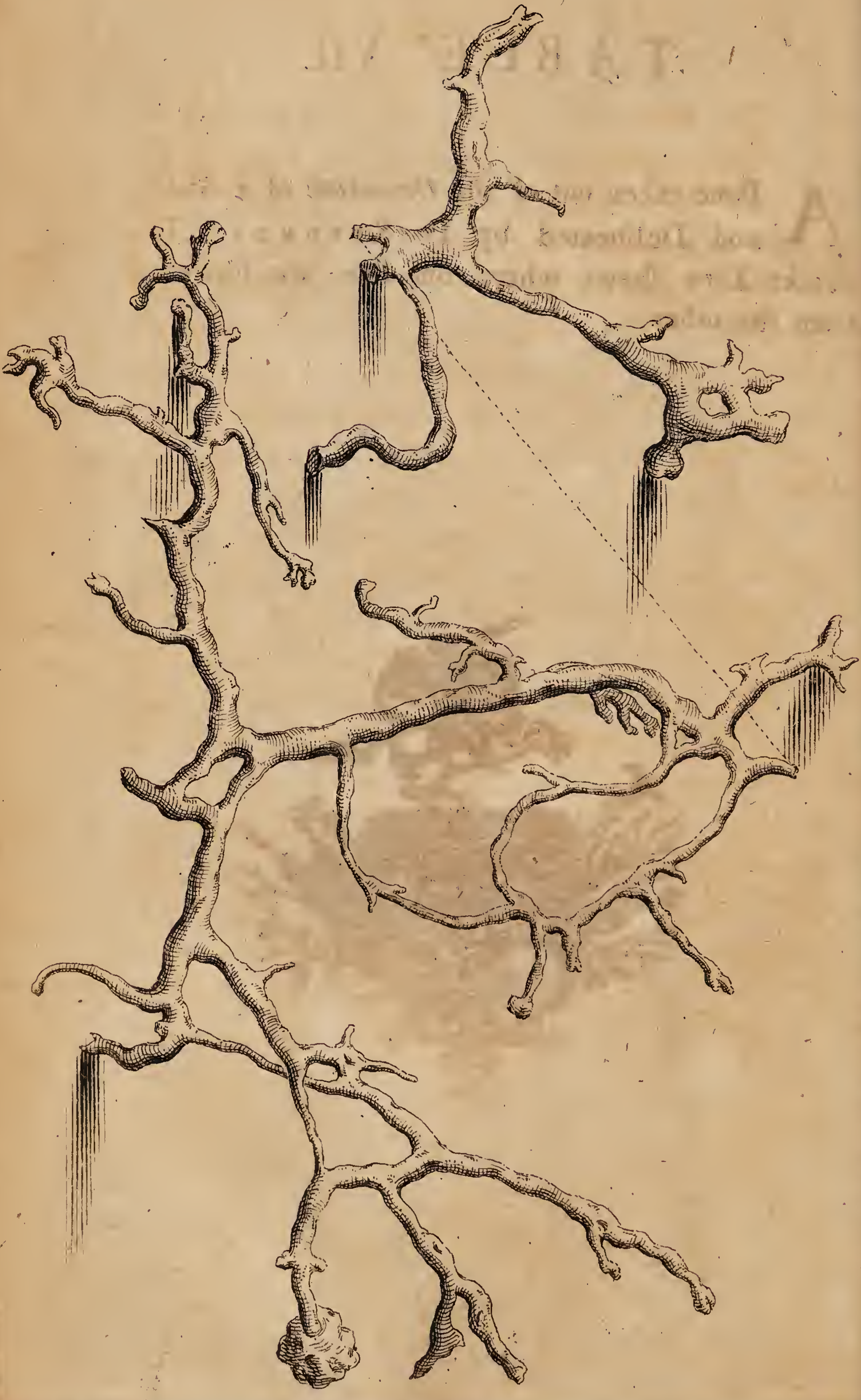

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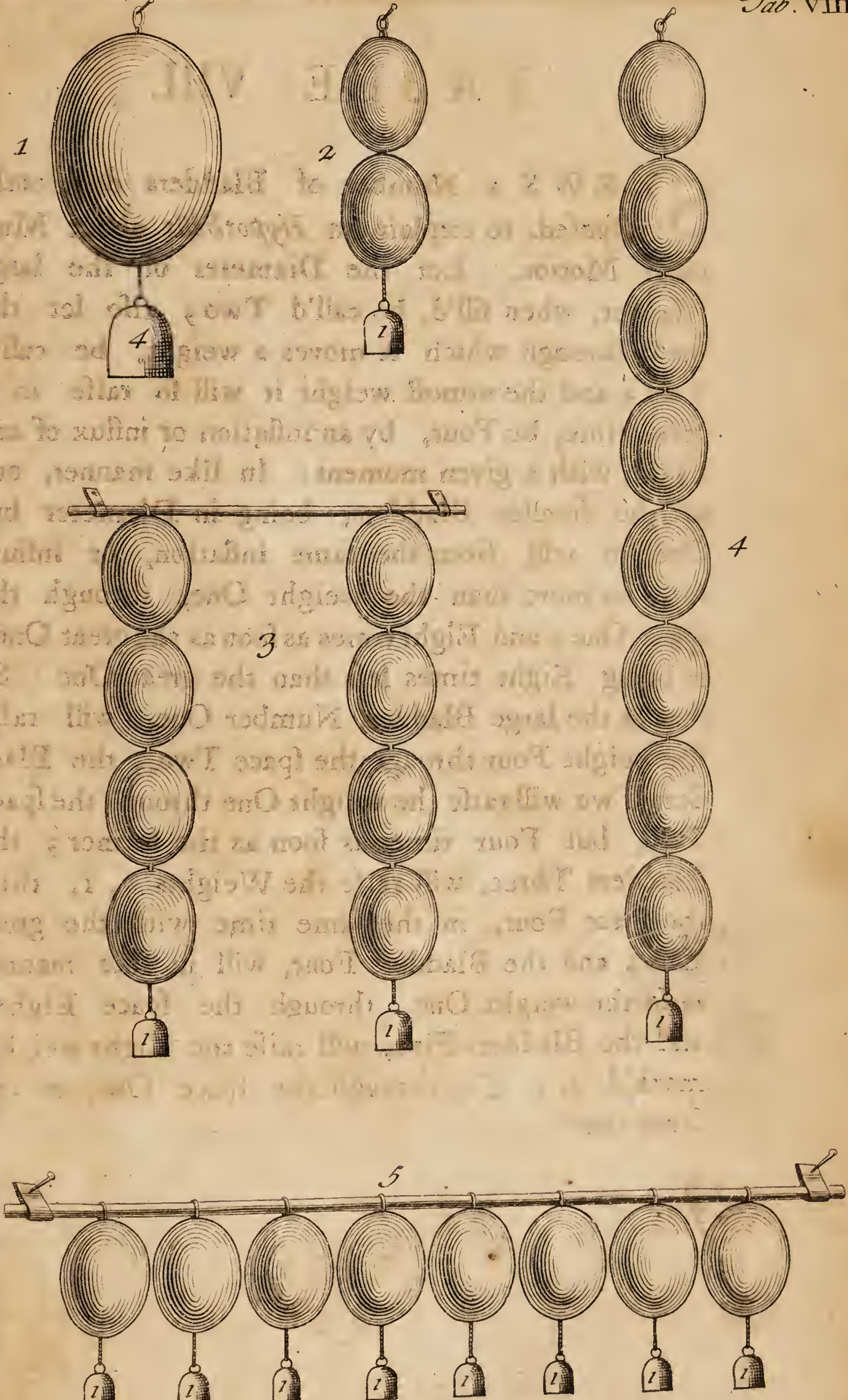
TABLE VII.

A Bone taken out of the *Omentum* of a Sheep, and Delineated by Dr. STEUKLY. The Prickt Line ſhews where one Part was broke off from the other.

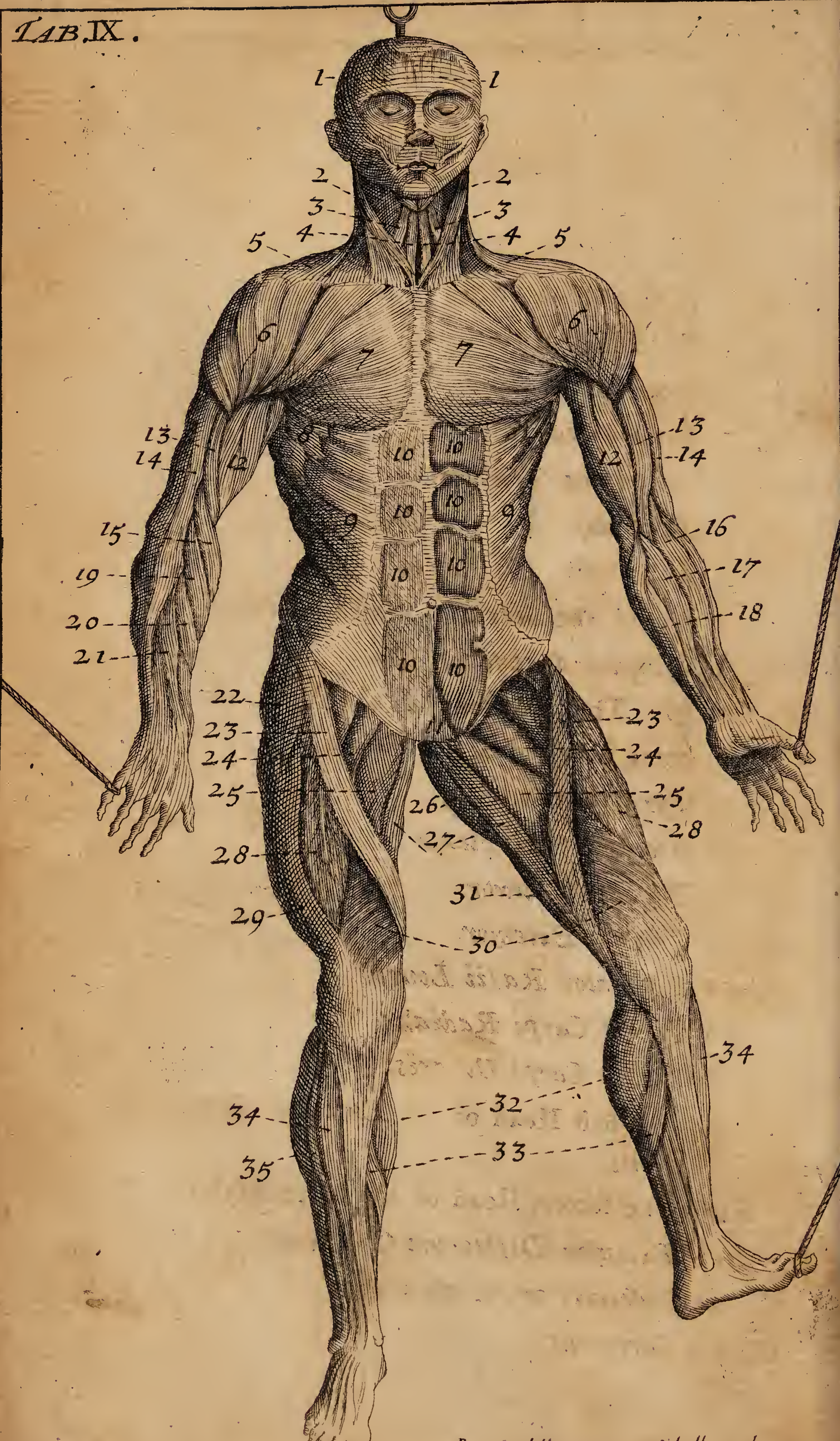
TABLE VIII.

SHEWS a Number of Bladders differently diſpoſed, to explain an *Hypotheſis* about Muſcular Motion. Let the Diameter of the large Bladder, when fill'd, be call'd Two; alſo let the ſpace through which it moves a weight, be call'd Two; and the utmoſt weight it will ſo raiſe in a given time, be Four, by an inflation or influx of any Fluid, with a given moment: In like manner, one of the ſmaller Bladders, being in Diameter but One, it will, from the ſame inflation, or influx, raiſe no more than the weight One, through the ſpace One; and Eight times as ſoon as the great One; it being Eight times leſs than the great One: So that as the large Bladder, Number One, will raiſe the weight Four through the ſpace Two, the Bladders Two will raiſe the weight One through the ſpace Two, but Four times as ſoon as the former; the Bladders Three, will raiſe the Weights 1, 1, thro' the ſpace Four, in the ſame time with the great One; and the Bladders Four, will in like manner raiſe the weight One, through the ſpace Eight; and the Bladders Five, will raiſe the Eight weights mark'd, 1, 1. *&c.* through the ſpace One, in the ſame time.

Tab. VIII



TAB. IX.



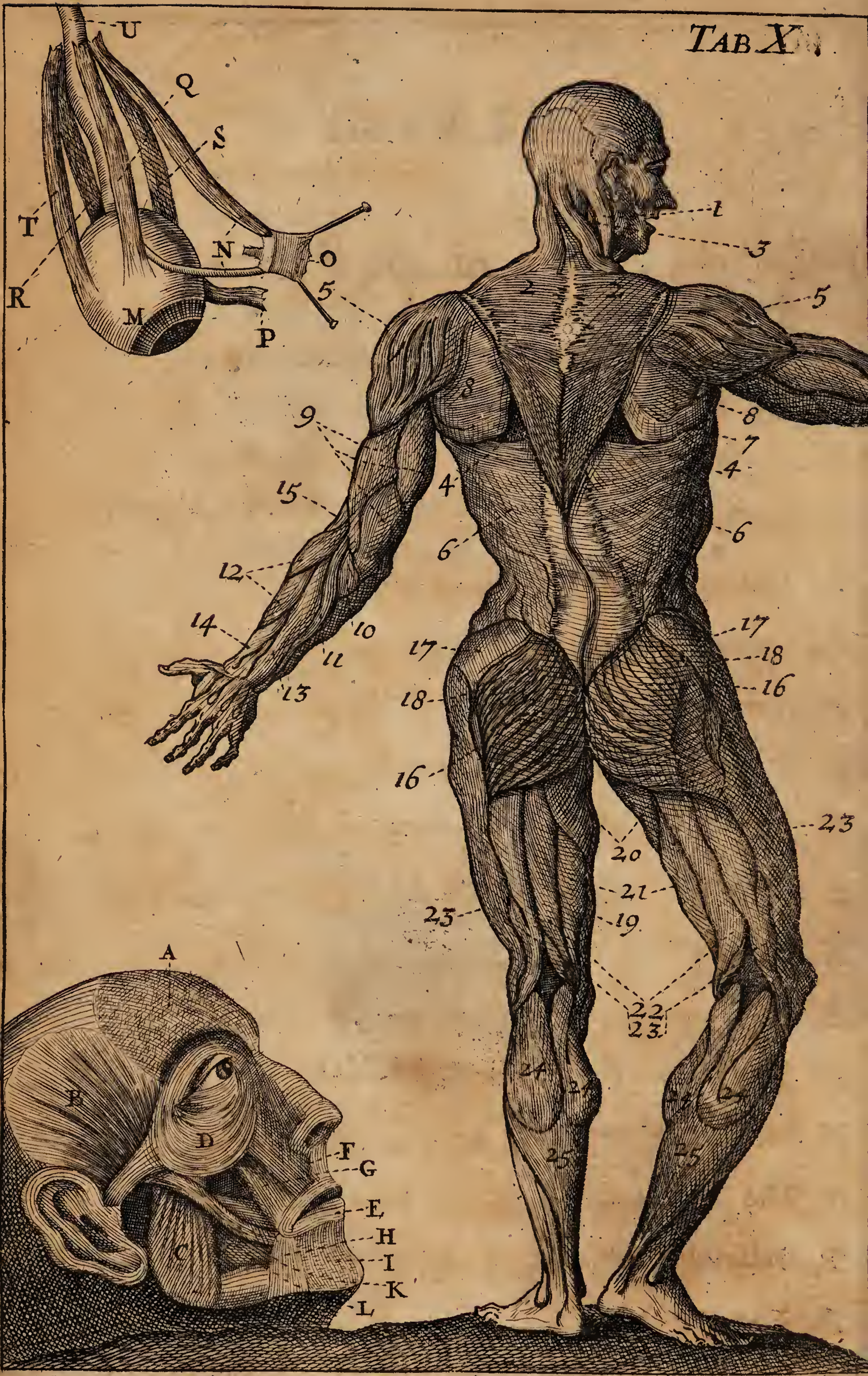
Brown delin: Sutton Nicholls sculp:

TABLE IX.

1, 1 F*Rontalis.*
2, 2 *Maſtoideus.*
3, 3 *Coracobrachialis.*
4, 4 *Sternohyoideus.*
5, 5 Part of the *Trapezius.*
6, 6 *Deltoides.*
7, 7 *Pectoralis.*
8 Part of the *Serratus Major anticus.*
9 *Obliquus deſcendens.*
10, 10, *&c.* The Portions of the *Recti*, the Left being diveſted of its *Faſcia.*
11 *Pyramidales.*
12, 12 *Biceps Cubiti Flexor.*
13, 13 *Bracheus Flexor.*
14, 14 *Triceps Extenſor.*
15, 16 *Supinator Radii Longus.*
17 *Flexor Carpi Radialis.*
18 *Flexor Carpi Ulnaris.*
19 The firſt Head of the *Extenſor Carpi Radialis.*
20 The ſecond Head of the ſame Muſcle.
21 *Extenſor Digitorum Communis.*
22 *Faſcialis* or *Membranoſus.*
23, 23 *Sartorius.*

24, 24 One Head of the *Triceps.*
25, 25 *Pectineus.*
26 The great Head of the *Triceps.*
27 *Gracilis.*
28, 28 *Rectus.*
29 *Vaſtus Externus.*
30 *Vaſtus Internus.*
31 *Semitendinoſus.*
32 *Gaſterocnemeus.*
33 *Soleus.*
34, 34 *Tibialis Anticus.*
35 *Tenſor Pollicis Pedis Longus.*

TAB X



Brown delin: Sutton Nicholls sculp.

TABLE X.

MUSCLES of the FACE.

A, F*Rontalis.*

B, *Temporalis.*

C, *Maſſeter.*

D, *Orbicularis.*

E, *Sphincter Oris.*

F, *Elevator Labii ſuperioris proprius.*

G, *Elevator Labiorum communis.*

H, *Depreſſor Labiorum communis.*

I, *Depreſſor Labii inferioris proprius.*

K, *Zygomaticus.*

L, *Buccinator.*

M, The Right Eye, with its Muſcles.

N, *Obliquus ſuperior.*

O, The *Trochlea.*

P, *Obliquus inferior.*

Q, *Elevator Oculi.*

R, *Depreſſor Oculi.*

S, *Ab-*

S, Adductor Oculi.

T, Abductor Oculi.

U, The Optick Nerve.

A View of the Poſterior External MUSCLES.

1 *Maſtoideus,*

2, 2 *Trapezius.*

3 A ſmall Part of the *Elevator Scapulæ.*

4, 4 Part of the *Rhomboides.*

5, 5 *Deltoides.*

6, 6 *Latiſſimus Dorſi.*

7 *Teres Major.*

8, 8 *Infraſpinalis Scapulæ.*

9 *Triceps extenſor Cubiti.*

10 *Anconeus.*

11 *Extenſor Carpi Ulnaris.*

12 *Extenſor Carpi Radialis.*

13 *Extenſor Digitorum Communis.*

14 *Extenſor Primi Internodii Pollicis.*

15 A ſmall Part of the *Supinator Radii longus.*

16, 16 *Gluteus Maximus.*

17, 17 *Guteus Medius.*

18, 18 *Membranoſus* or *Faſcialis.*

19 *Gracilis.*

20 The great Head of the *Triceps.*

21 *Semimembranoſus.*

22 *Semitendinoſus.*

23 *Biceps Tibiæ.*

23 *Vaſtus Externus.*

24, 24, &c. *Gaſterocnemeus.*

25, 25 The Tendinous part of the *Gaſterocnemeus* over the *Soleus.*

TABLE XI.

A, A Bone taken out of the Muſcular part of the Heart of a Man. *Vid. Page* 3.

B, A Bone taken out of the firſt Proceſs of the *Dura Mater*, not far from the *Criſta Galli*.

C, *D*, The Two Bones mention'd, *pag.* 49, 50.

C, Shews the under-ſide of that part of the *Os Bregmatis* that was depreſs'd.

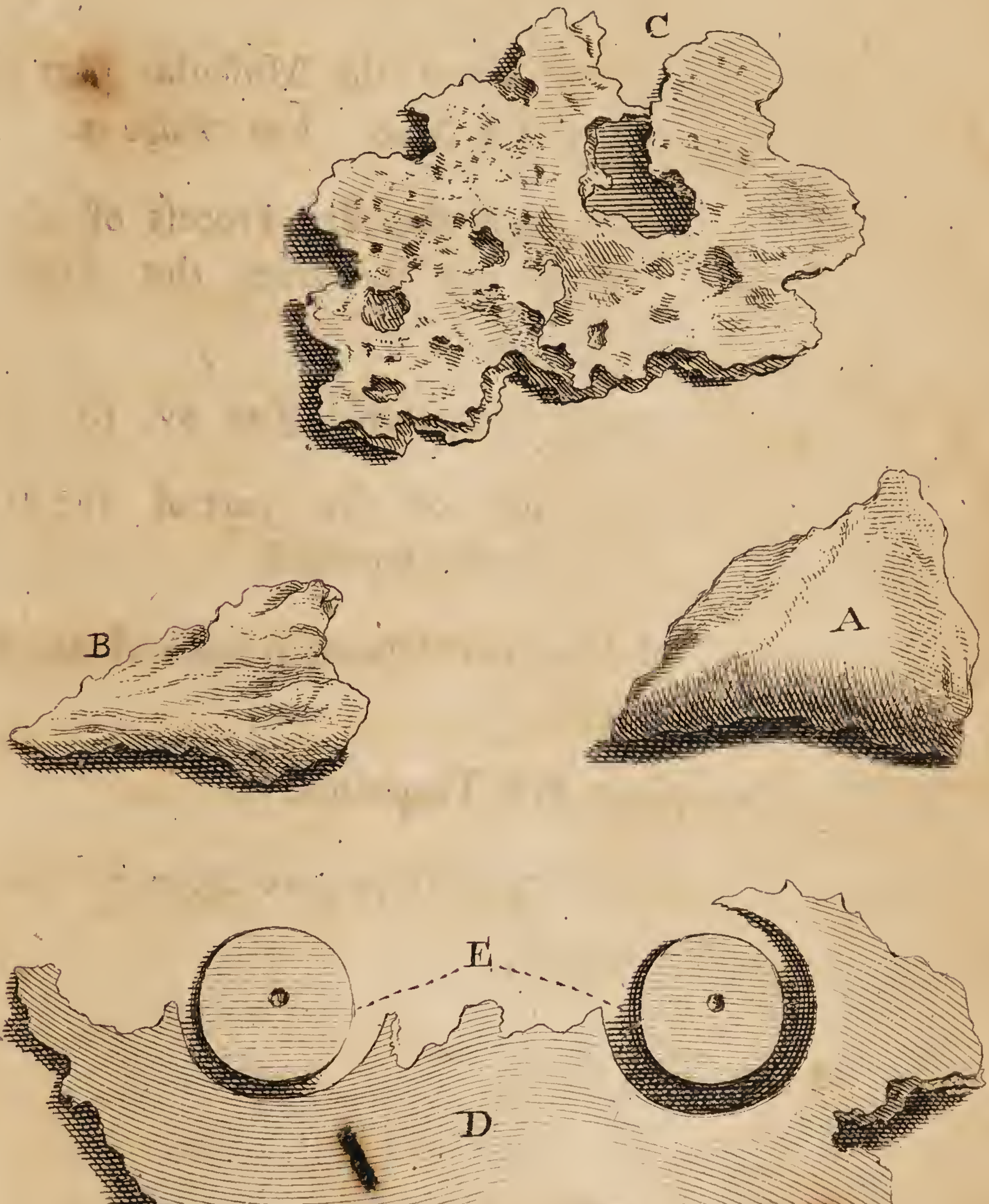
D, The piece of Bone that ſeparated laſt and which was not depreſs'd.

E, The Two places firſt Trephin'd.

F, The place laſt Trephin'd to give more vent to the Matter.

⁂

Tab. XI



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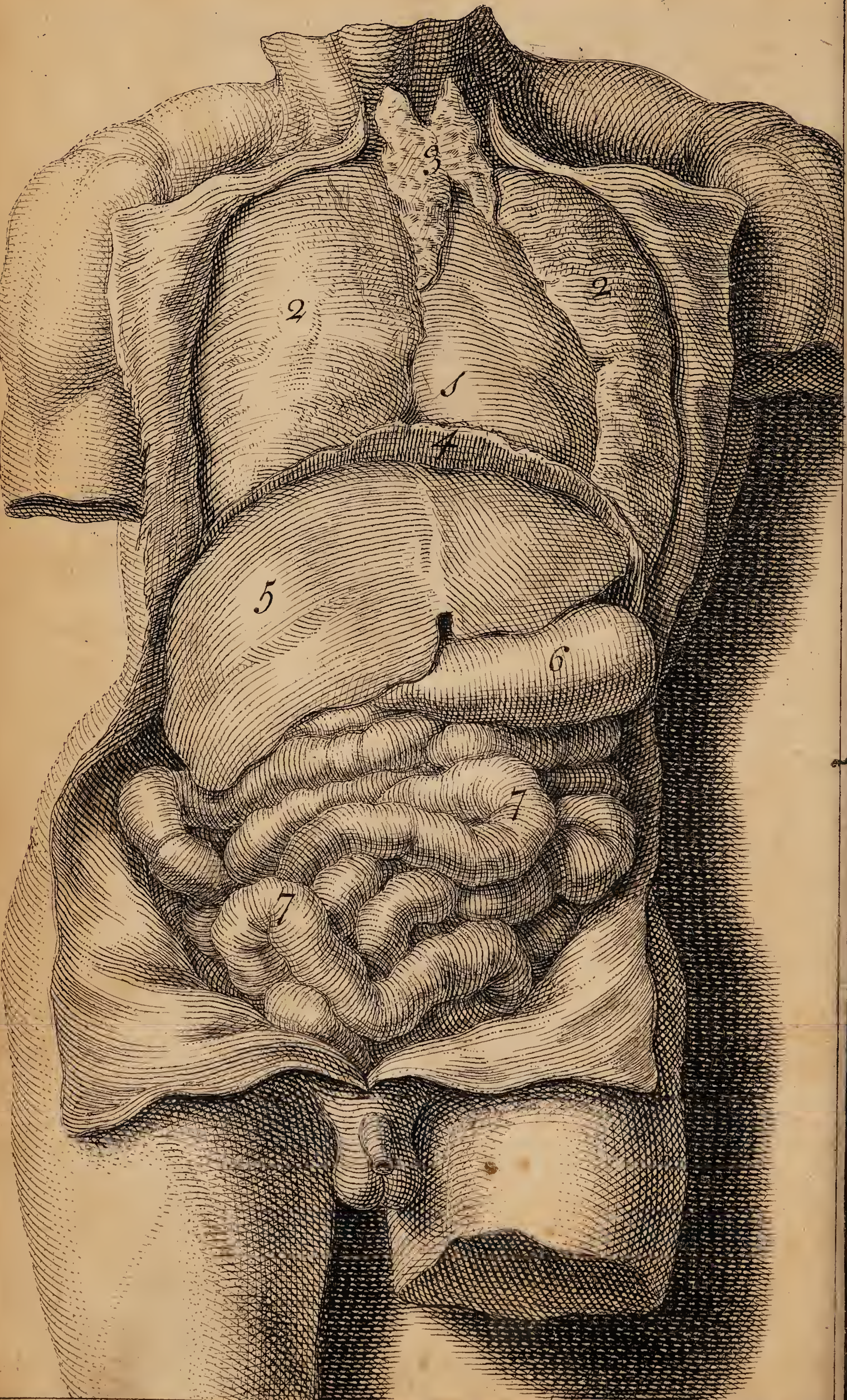

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TABLE XII.

1 THE *Pericardium* covering the Heart.

2, 2 The Lungs.

3 The Gland *Thymus.*

4 The Diaphragm.

5 The Liver.

6 The Stomach.

7, 7 The ſmall Guts.

* * *

TABLE XIII.

A, THE Liver.

B, The Gall Bladder.

C, The *Pancreas*.

D, The Splene.

E, One of the Renal Glands.

F, *F* The Kidneys.

G, *G* The Ureters.

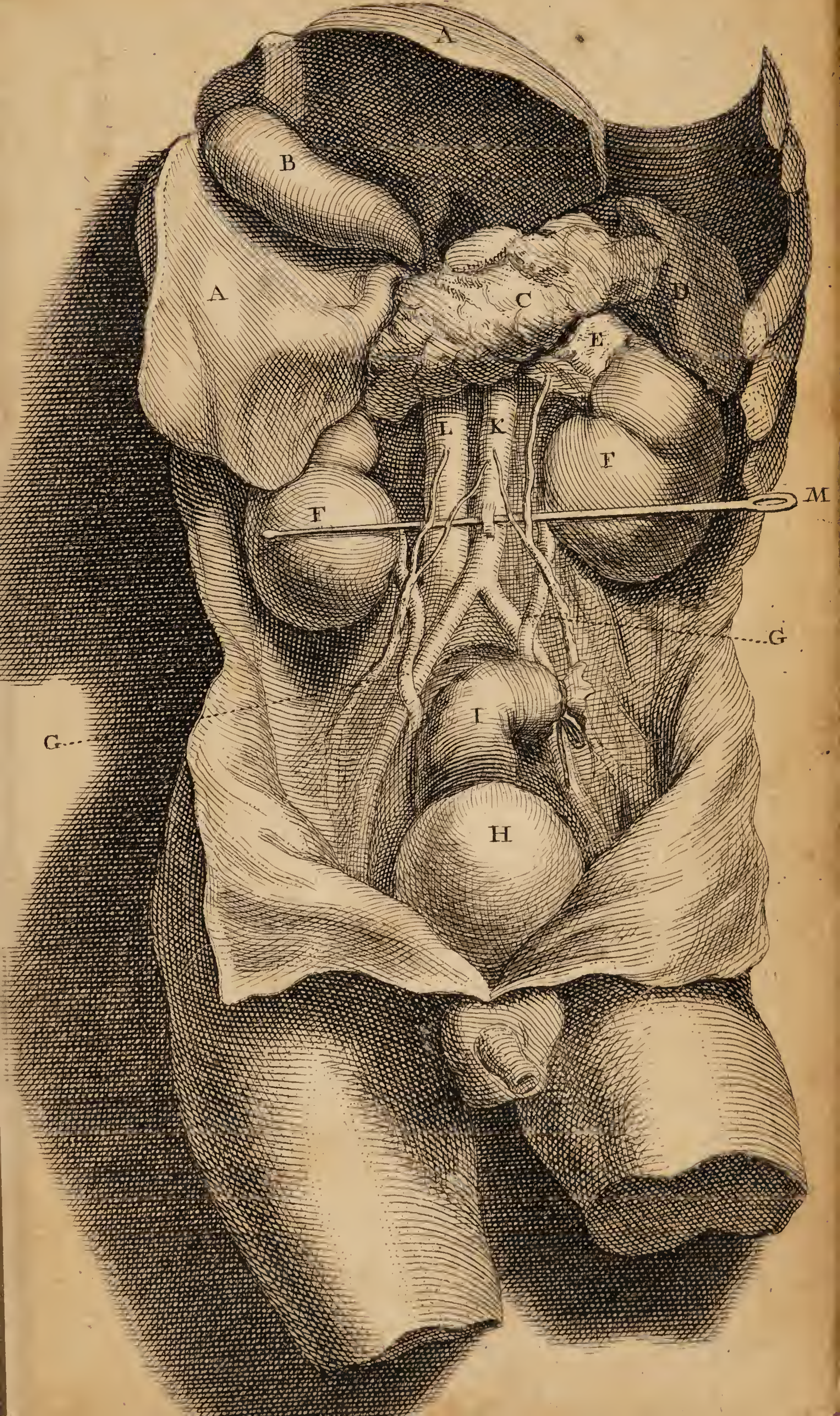
H, The Bladder of Urine diſtended.

I, The *Rectum Inteſtinum*.

K, The *Aorta*.

L, The *Vena Cava*.

M, The Four Spermatick Arteries, with the *Arteria Meſenterica Inferior*, rais'd over a Probe; the middle one the *Arteria Meſenterica inferior*; the Two next the Spermatick Arteries ariſing from the *Aorta*; the outmoſt the Spermatick Veins, the Right ending in the *Cava*, the Left in the Left Emulgent Vein.


A
B
A
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G
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TAB. XIIII.

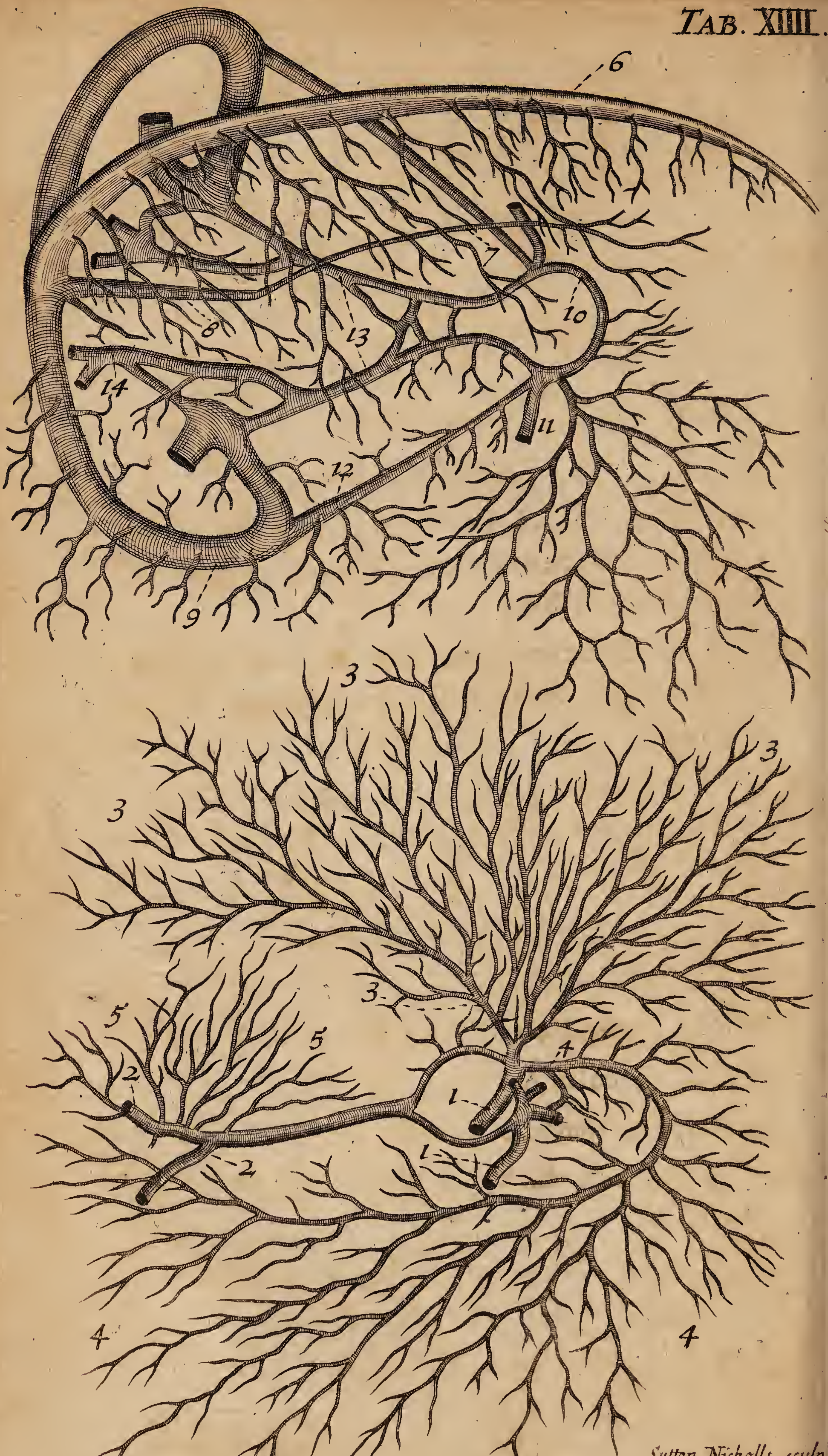

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TABLE XIV.

The VESSELS *of the* BRAIN *fill'd with Wax.*

1, 1 THE Carotid Artery.

2, 2 The Cervical Artery.

3, 3, *&c.* The Branches of the Carotid Artery which paſs between the Lobes of the Brain on the Left Side.

4, 4 The Branches from the Carotid Artery which paſs between the Hemiſpheres of the Brain.

5, 5 The Branches from the Cervical Artery, which are beſtow'd upon the *Cerebellum.*

6 The Superior Longitudinal *Sinus.*

7 The Inferior Longitudinal *Sinus.*

8 The Streight *Sinus.*

9 The Lateral *Sinus.*

10 The Circular *Sinus.*

11 A Vein from the Circular *Sinus.*

12 A *Sinus* at the upper Edge of the *Os Petroſum.*

13 A *Sinus* at the lower Edge of the *Os Petroſum.*

14 The Cervical *Sinus.*

TABLE XV.

ARTERIES *fill'd with Wax.*

1 PART of the deſcending *Aorta.*

2 *Arteria Celiaca.*

3 *Meſenterica Superior.*

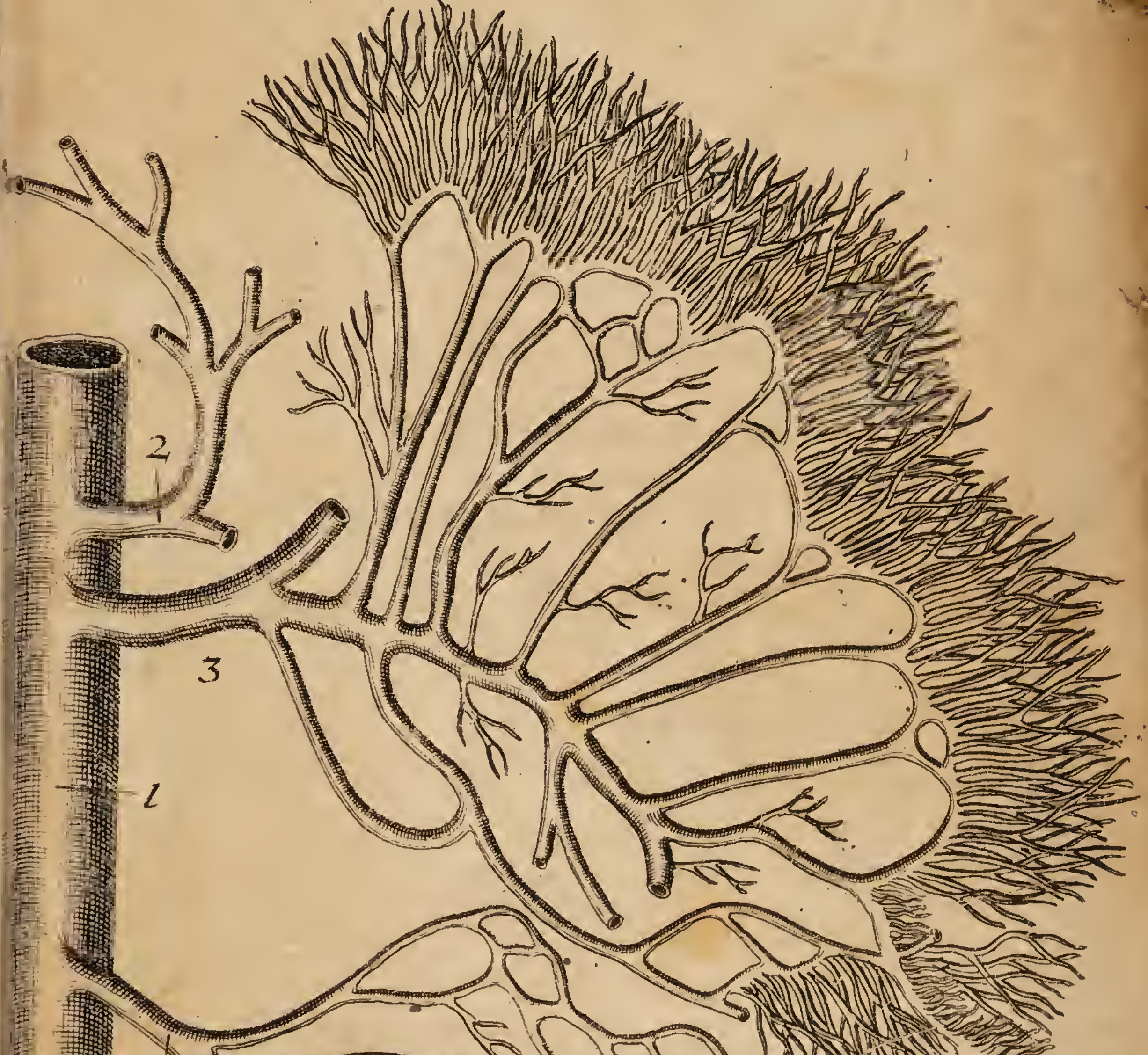
4 *Meſenterica Inferior.*

5 Part of the Communicant Artery.

6 Shews one of the Extreme Meſenteric Arteries, as it is diſtributed round the Inteſtine.

* * *

TABLE



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TAB. XVI.

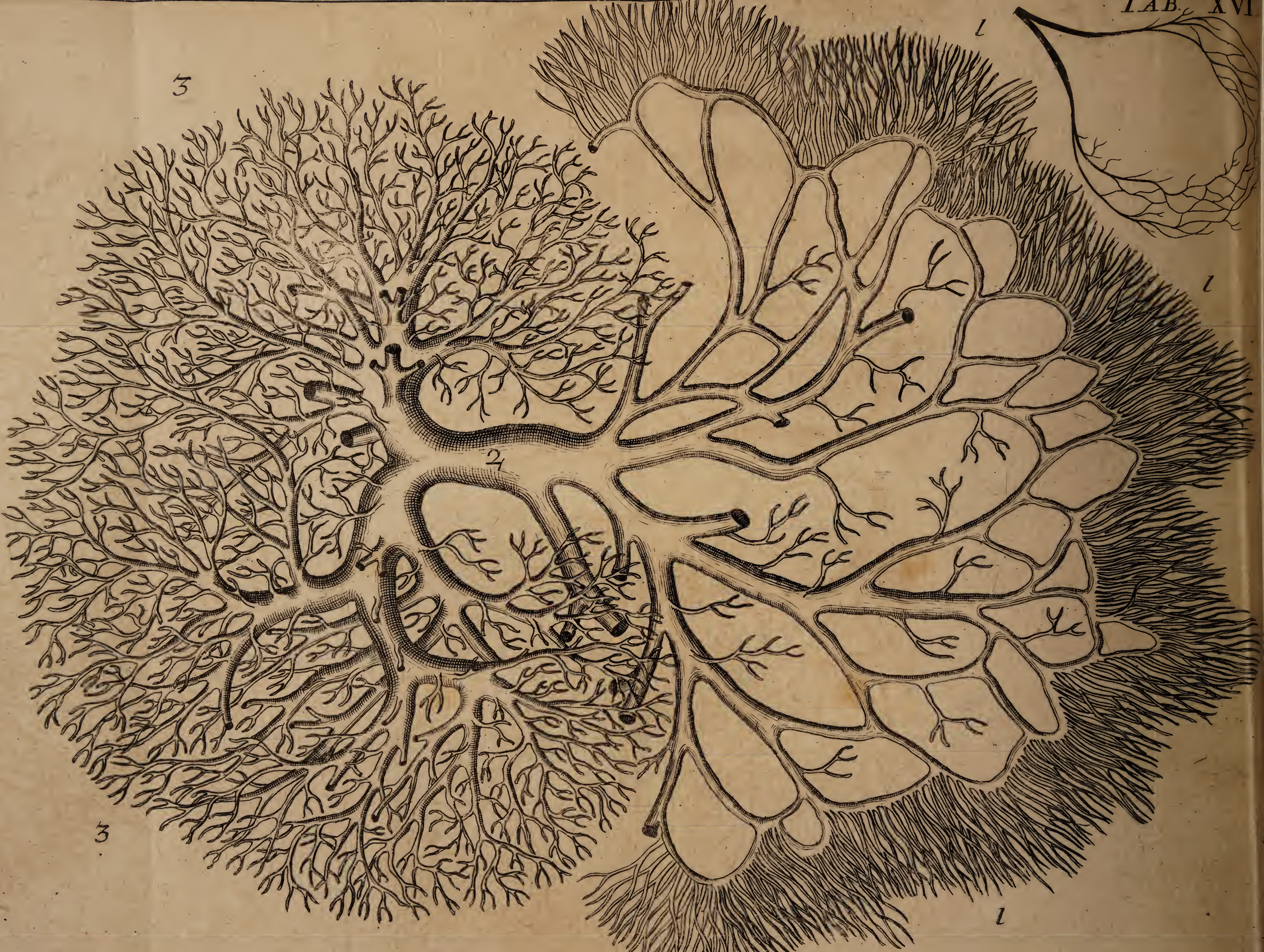


TABLE XVI.

The VENA PORTÆ *fill'd with Wax.*

1, 1, 1 THE Extreme Branches of the *Vena Portæ* in the Meſentery.

2 The ſingle Trunk of the *Vena Portæ* entering the Liver.

3, 3, 3 The Extreme Branches of the *Vena Portæ* in the Liver.

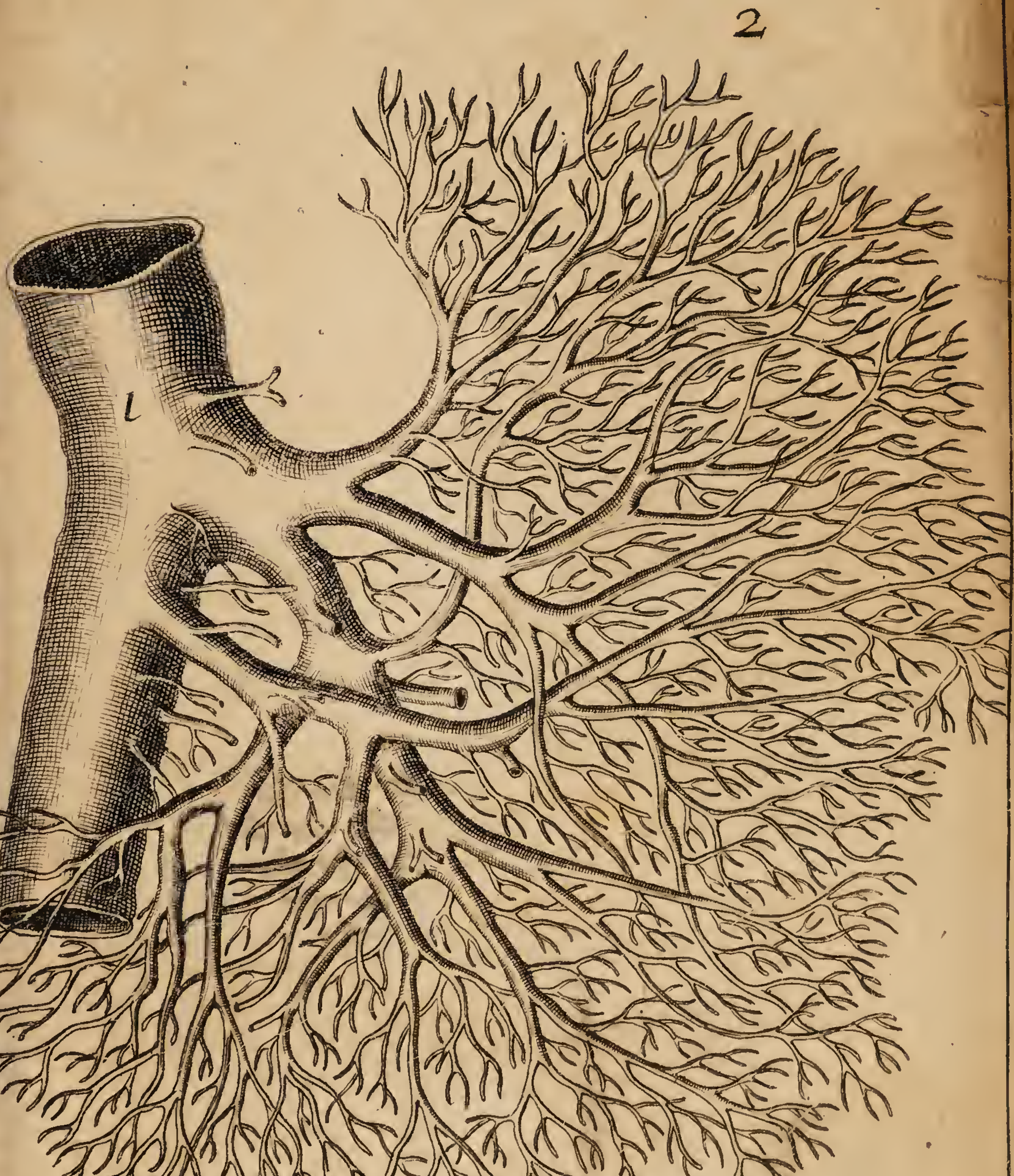
TABLE XVII.

The VEINS *of the* LIVER.

1 PART of the *Vena Cava Aſcendens.*

2, 2, 2 The Branches of the *Cava* taken out of the Liver.

TAB. XVII.



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TAB. XVIII.

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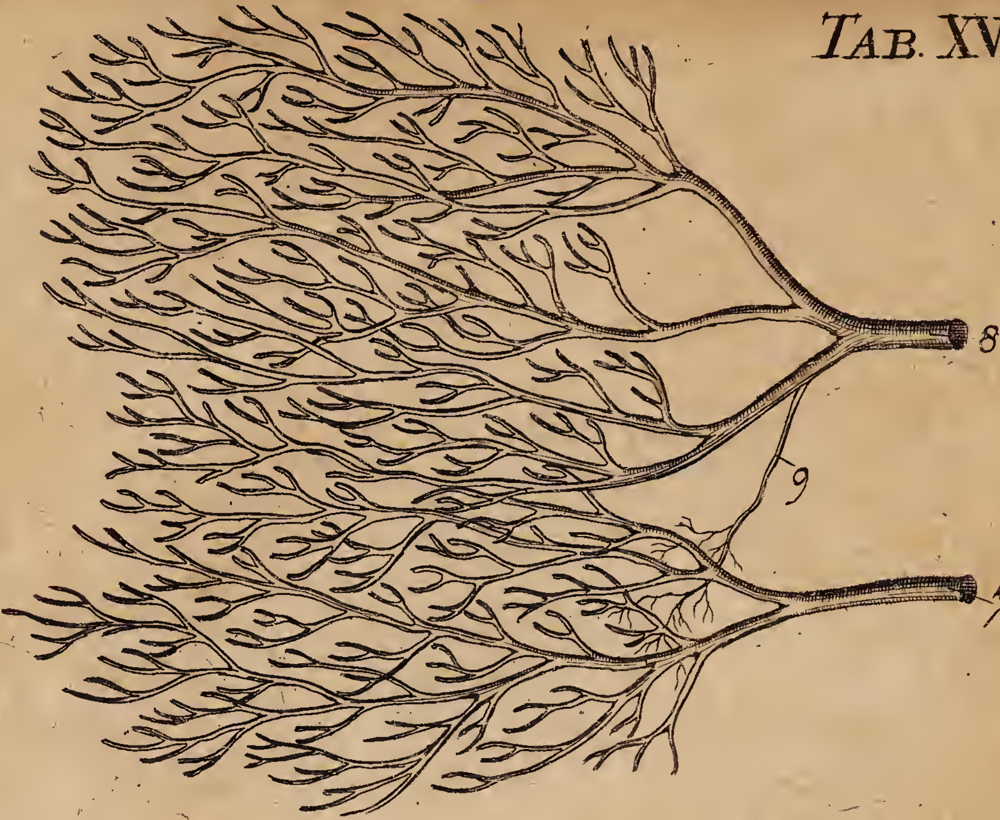


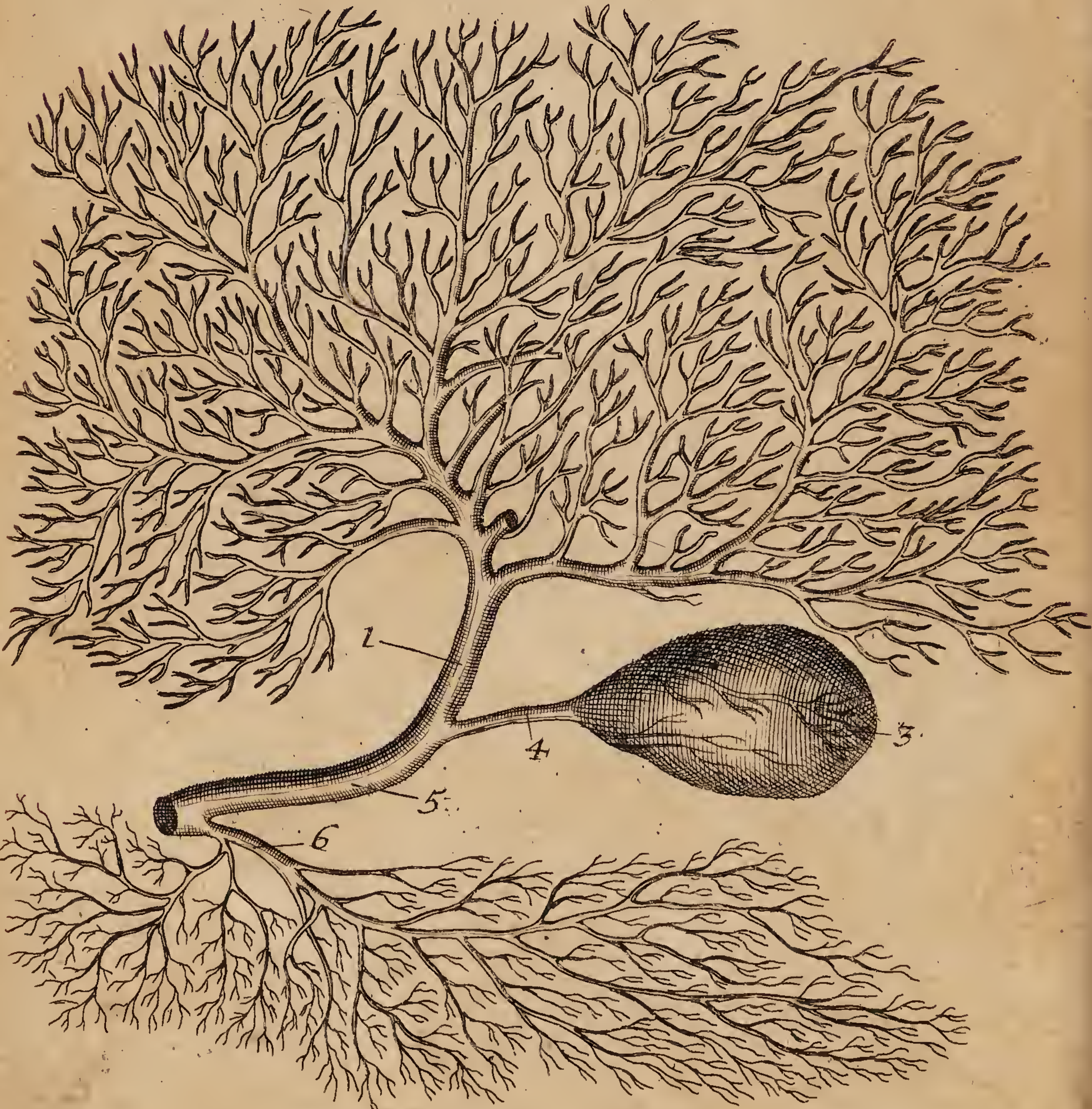


TABLE XVIII.

The EXCRETORY DUCTS *and* ARTERIES *of the* LIVER.

1 DUCTUS *Hepaticus*, with its Branches, taken out of the Liver.

3 The Gall-Bladder.

4 *Ductus Cyſticus.*

5 *Ductus Communis Choledochus.*

6 *Ductus Pancreaticus.*

7 The Hepatic Artery, which is given off from the Superior Meſenteric.

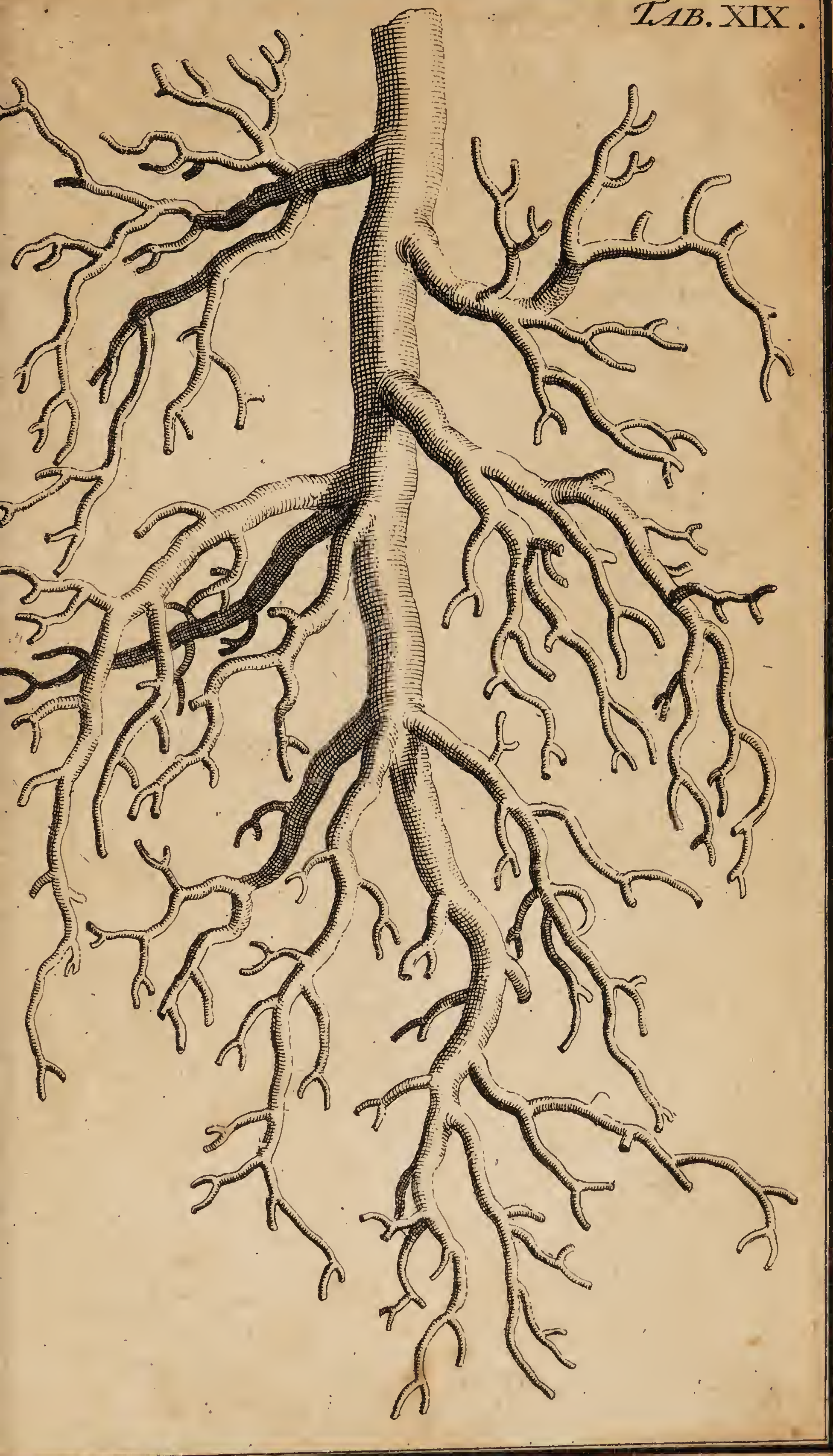
8 The Hepatic Artery, which is given off from the Celiac.

9 *Arteria Cyſtica.*

TABLE XIX.

A *Polipus* cough'd up out of the Lungs, which admirably ſhews the manner of the *Aſpera Arteria* dividing in the Lungs. Communicated to me by the late Dr. *Oliver Horſeman.*

⁂



TAB. XX.

Fig. I.

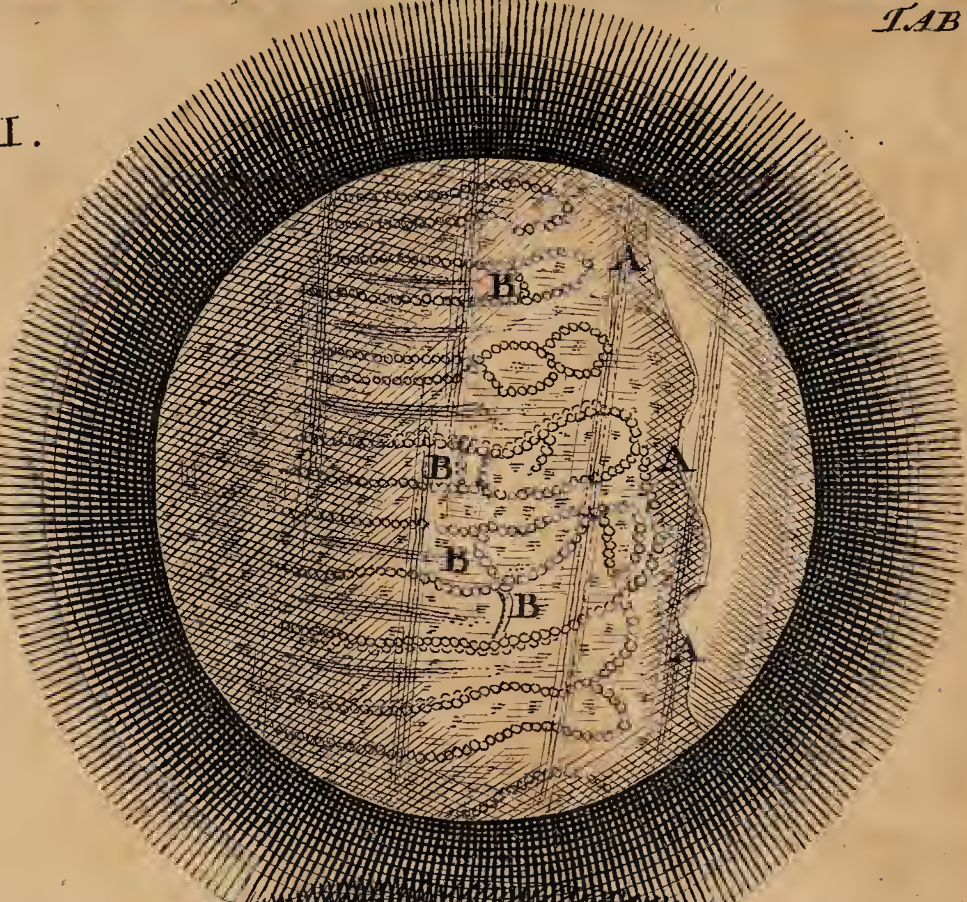


Fig. II.

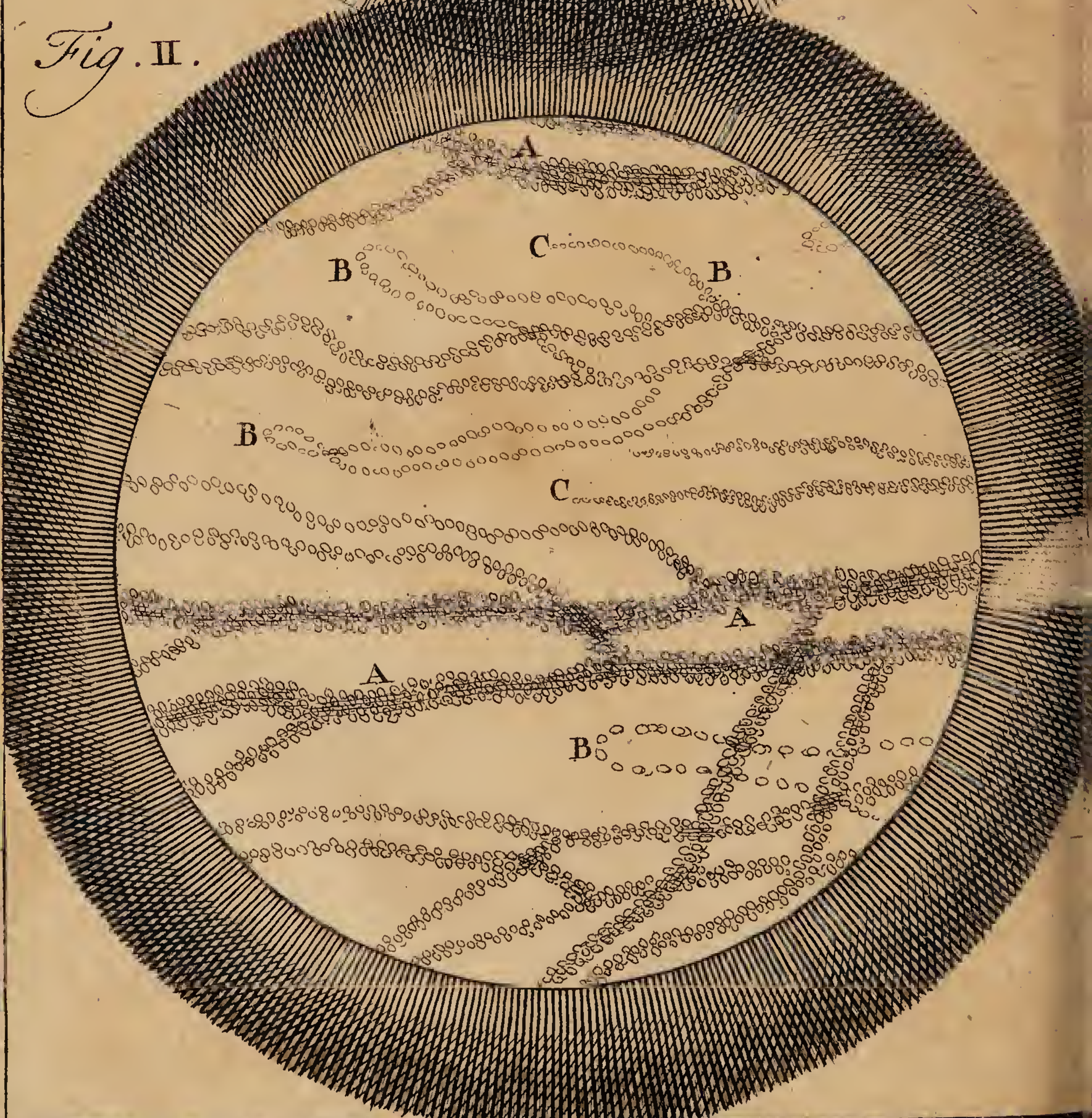


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TABLE XX.

Figure 1.

SHEWS the Circulation of the Blood, in the Tail of a *Greg*, from Mr. *Cooper*.

A, A, A Where the Extremities of the Arteries and Veins Communicate.

B, B, B, B Several other Communications.

Figure 2.

ſhews the Circulation of the Blood, in the Tail of a *Gudgeon*.

A, A, A The large Veſſels.

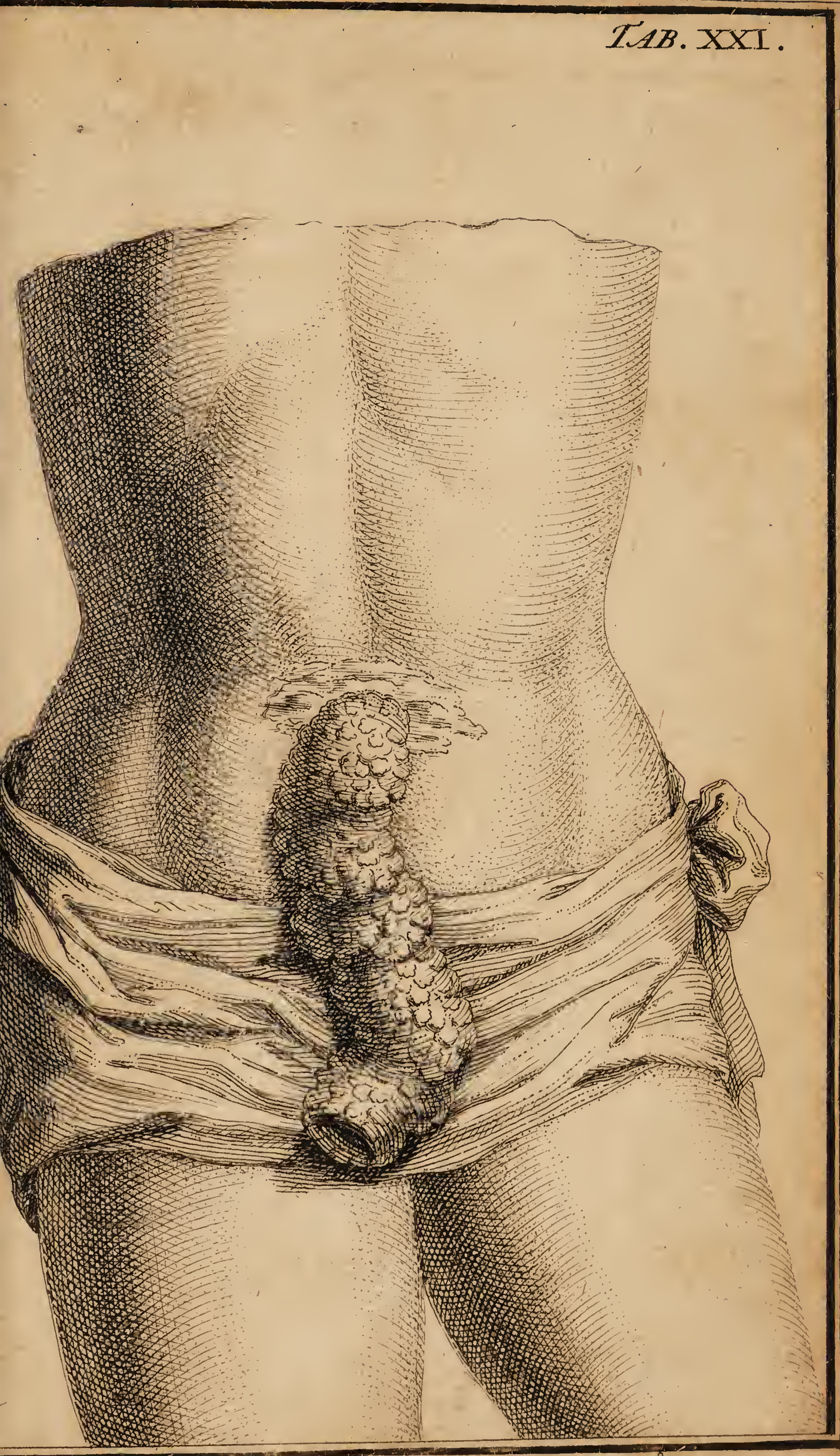
B, B, B The Extremities of Arteries communicating with Veins.

C, C Some ſmall Veſſels whoſe Extremities cou'd not be ſeen for the thickneſs of the Tail.

TABLE XXI.

THE Caſe of Mrs. *Stoneſtreet* of *Lewis.* Vid. Pag. 137.

TAB. XXI.



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TAB. XX

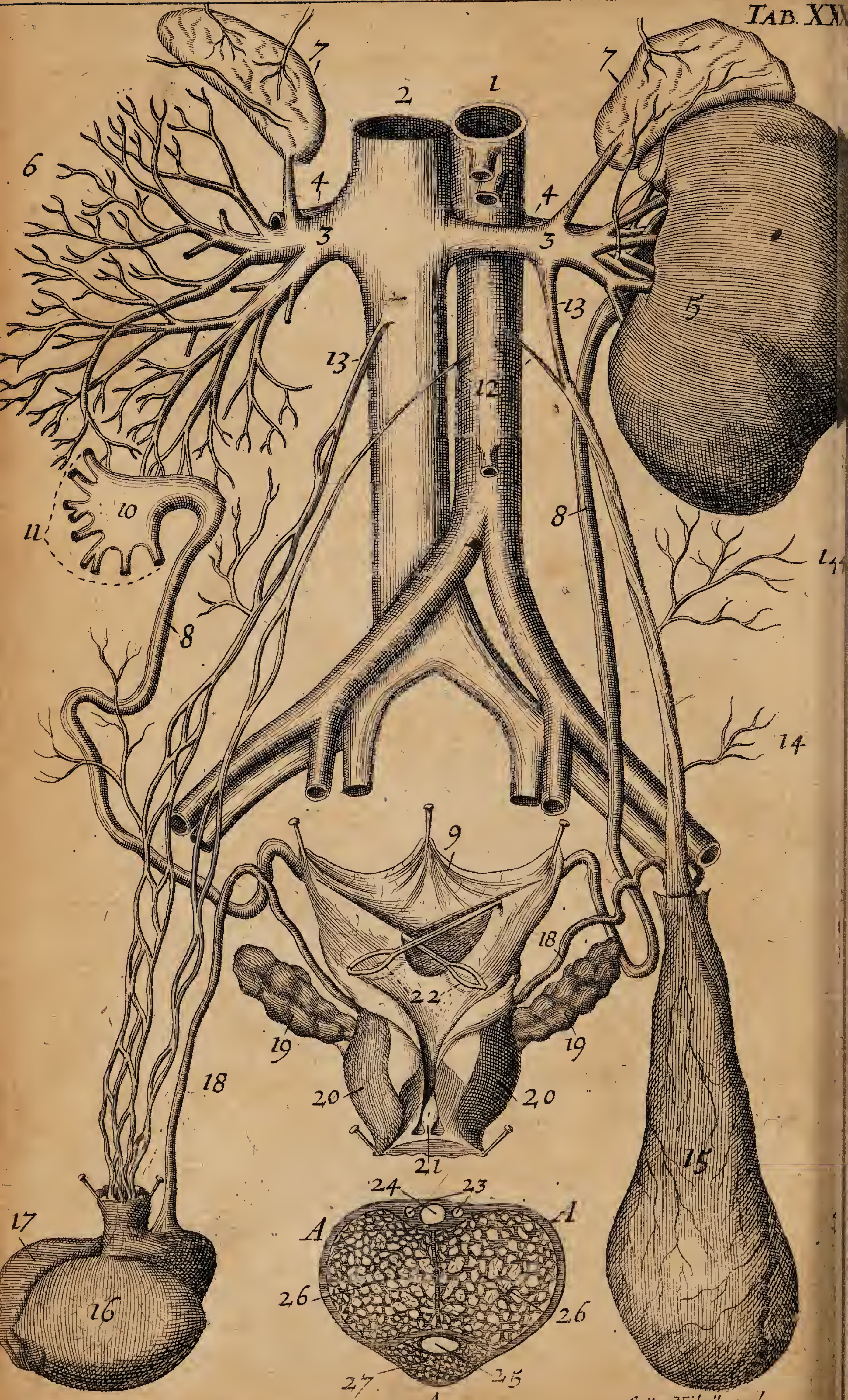

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TABLE XXII.

The Urinary and Genital Parts of a MAN.

1 *ARTERIA Aorta Deſcendens.*

2 *Vena Cava Aſcendens.*

3, 3 The Emulgent-Veins.

4, 4 The Emulgent-Arteries.

5 The Left Kidney.

6 The Emulgent-Vein taken out of the Right Kidney.

7, 7 *Glandulæ Renales.*

8, 8 The *Ureters.*

9 Part of the Bladder of Urine.

10 The *Pelvis* of the Right *Ureter* taken out of the Kidney.

11 The *Tubuli Urinarii* taken out of the Right Kidney.

12 The Spermatic Arteries.

13 The Spermatic Veins, the Right entering the *Cava*, and the Left the Emulgent.

Collateral

14, 14 Collateral Branches of the Spermatic-Vein, which on this ſide are not laid bare, and ſeparated from the Artery which runs in the ſame Membrane with it.

15 The Left Teſticle included in the *Proceſſus Vaginalis* or *Elythroides.*

16 The Right Teſticle denuded.

17 The Right *Epididymis.*

18, 18 The *Vaſa Deferentia.*

19, 19 The *Veſiculæ Seminales.*

20, 20 The *Proſtatæ.*

21 The *Roſtrum Gallinaginis* in the *Urethra.*

22 Two Probes put into the Ureters, to ſhew their oblique Paſſage into the Bladder of Urine.

A, A A tranſverſe Section of the *Penis* prepar'd with *Mercury.*

23 The Two Arteries of the *Penis.*

24 The *Vena Ipſius Penis.*

25 The *Urethra.*

26, 26, The *Corpora Cavernoſa Penis.*

27 The *Corpora Cavernoſa Urethræ.*

TAB. XXIIII

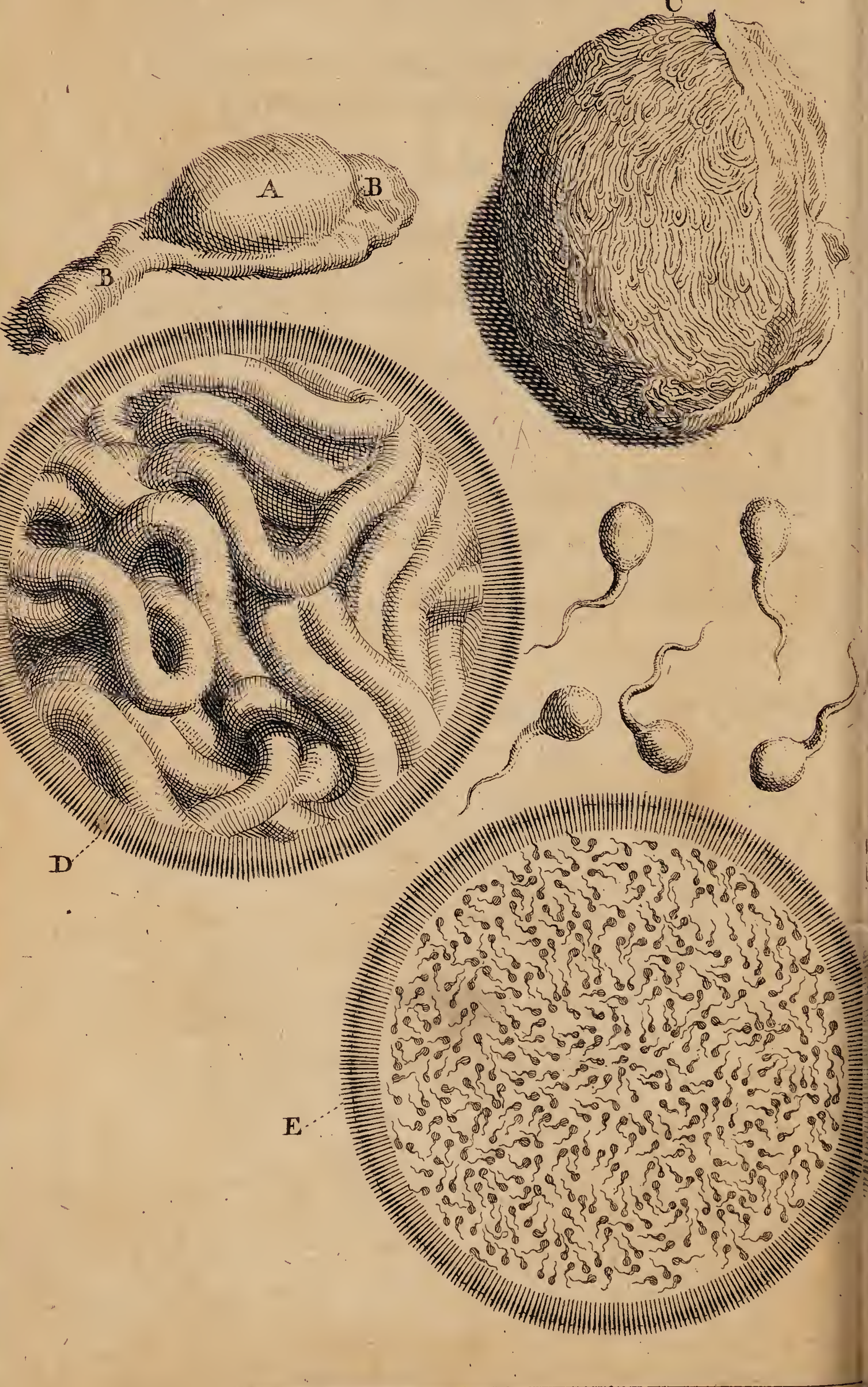


TABLE XXIII.

A THE Teſticle of a *Rat.*

B, B The *Epididymis.*

C The ſame Teſticle diveſted of the *Tunica Albuginea*, and magnified to ſhew the Convolutions of the Veſſels.

D An inward Portion of ſame Teſticle more magnified.

E A Group of *Animalculæ*, as they appear in the Male Seed in a Microſcope, and Five other beſides more magnified, but not repreſented enough like *Tadpoles.*

TABLE XXIV.

THE Parts of Generation in Women, the lower ſide of the *Vagina* being laid upward, and cut open.

1, 1 The *Labia.*

2, 2 The *Nymphæ.*

3 The *Glans* of the *Clitoris* extreamly large.

4 The *Præputium Clitoridis.*

5 The Orifice of the *Meatus Urinarius.*

6 The inſide of the *Vagina* where the *Rugæ* are to be ſeen.

7 *Os Tincæ.*

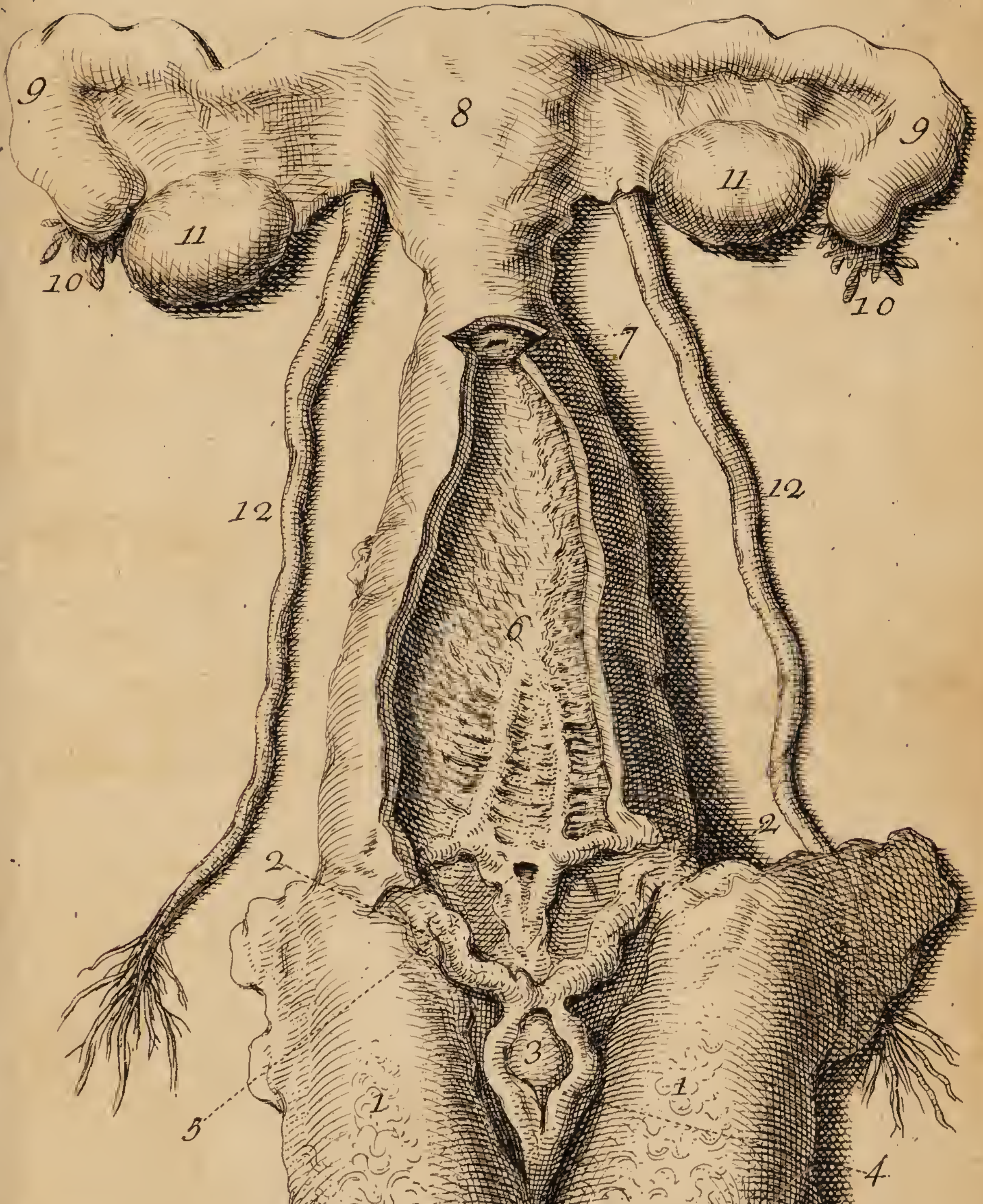
8 *Uterus.*

9, 9 *Tubæ Fallopianæ.*

10, 10 *Fimbriæ.*

11, 11 *Ovaria.*

12, 12 *Ligamenta Rotunda.*



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TAB XX

Fig. I.

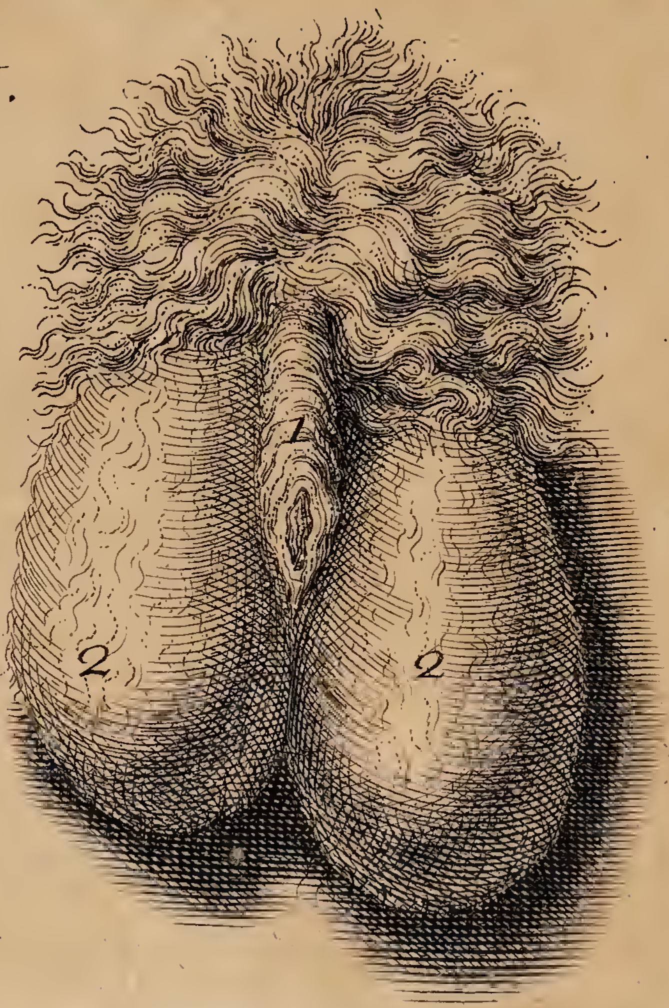

Fig. II.

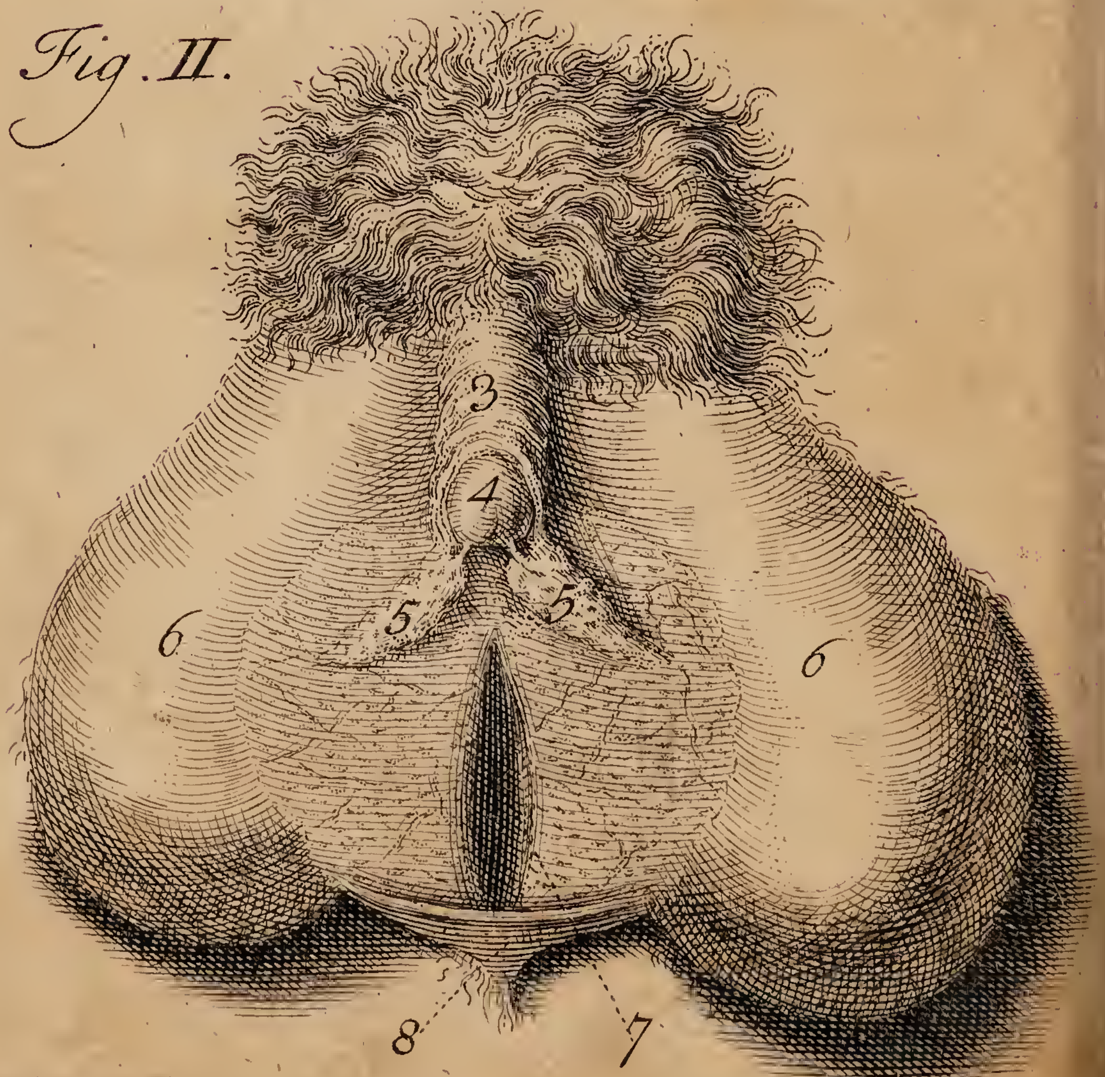

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TABLE XXV.

REPRESENTS the Parts of an *Hermaphrodite,* in which appear'd as much of the mixure of the Sexes as cou'd be; (but Dr. *Douglas,* to whom I am Oblig'd for this Cut and the Refeences, eſteems it a Female). I once examin'd anoher, in which I found a divided *Scrotum* juſt like he *Labia Pudendi,* with Teſticles in it, and a Uriary Paſſage between them, with a perfect *Clitoris* s large as a *Penis,* with an exceeding ſmall *Urehra,* thro' which came a little Urine.

Figure 1.

1 The *Clitoris* cover'd with its *Præputium.*

2 The two *Labia Pudendi.*

Figure 2.

3 The *Clitoris* cover'd with its *Præputium.*

4 The *Glans Clitoridis.*

5 The *Nymphæ.*

6 The *Labia* turn'd back, to ſhow the Entrance into the *Vagina* mark'd 7.

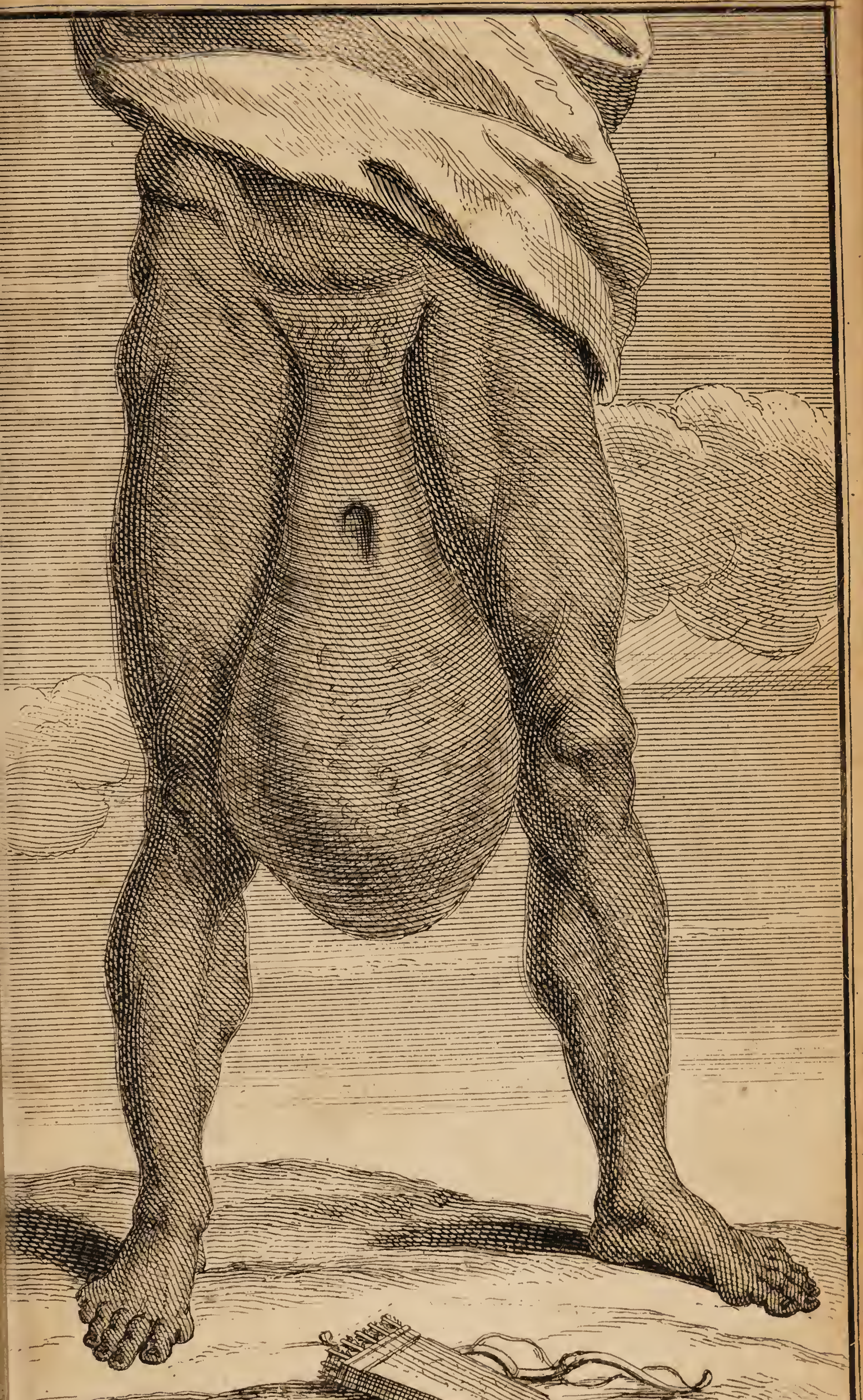
8 The *Furca Virginalis,* or the Skin that joins the two *Labia* at their lower part.

T A-

TABLE XXVI.

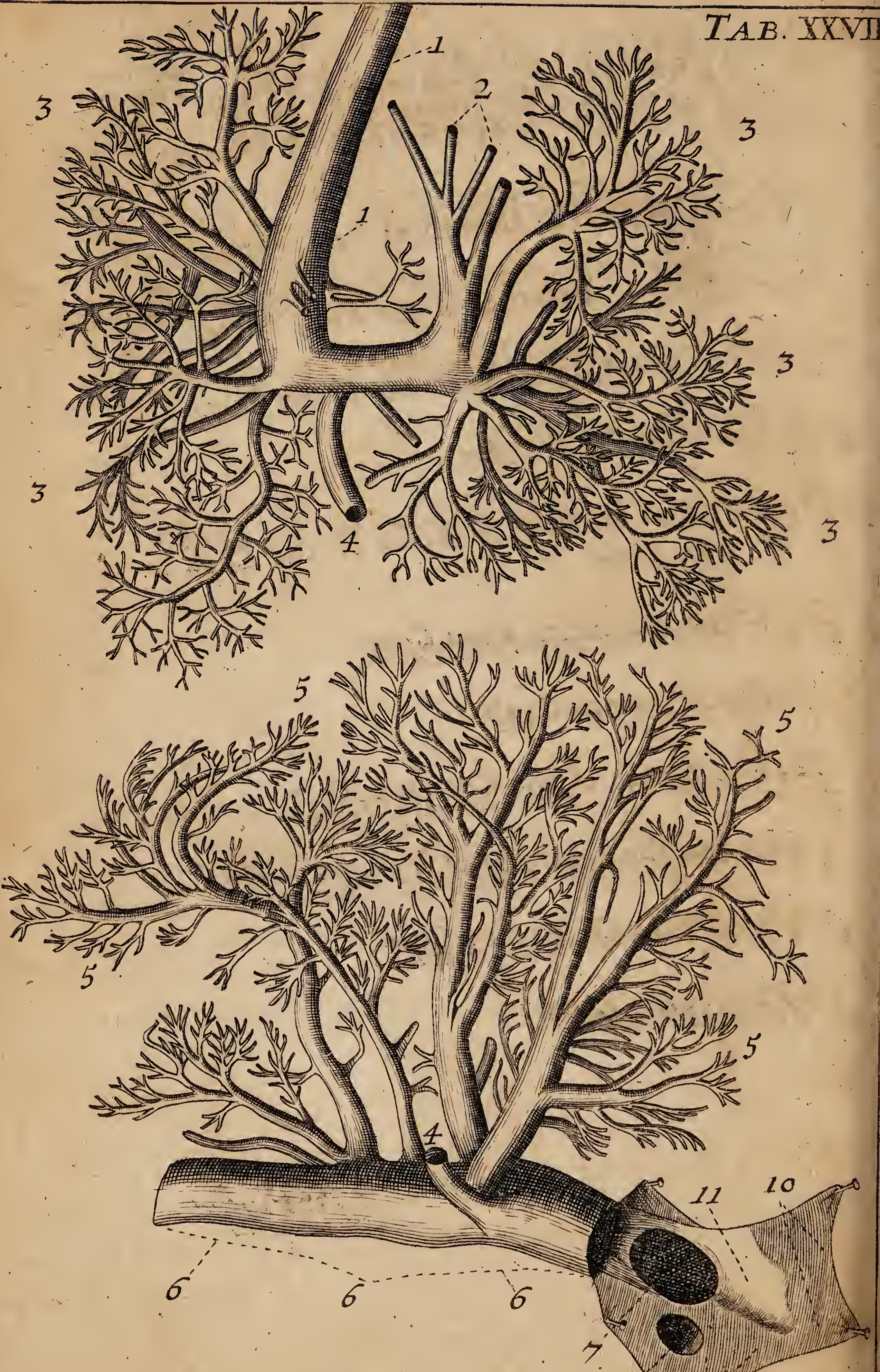
THE lower Parts of a *Negro*, whoſe *Scrotum* was ſwell'd to this ſize from a Kick (the Spermatick Veſſels being not at all thickned): The greateſt length was Twenty Seven Inches, and the greateſt Horizontal Circumference, Forty Two Inches. He was the late Mr. *Dickenſon*'s Patient in St. *Thomas*'s-*Hoſpital*; the Tumour was Solid, without Inflamation or Pain, but what Parts were affected we cou'd not learn, he not ſtaying for the Operation. At the Dark-place he cou'd pull out his *Penis*, when the *Scrotum* was lifted up.

Tab. XXVI.



V dr Gucht Sc.

TAB. XXVIII



Sutton Nicholls sculp.

TABLE XXVII.

The Vessels *of the* Liver, *&c.* *of a* Foetus, *fill'd with Wax.*

1, 1 THE Umbilical Vein.

2 Branches of the *Vena Portæ.*

3, 3, *&c.* The extreme Branches in the Liver.

4, 4 The *Ductus Venoſus.*

5, 5, *&c.* The extreme Branches of the *Cava* in the Liver.

6, 6, 6 The Aſcending *Vena Cava.*

7 The *Foramen Ovale.*

8 The Mouth of the Coronary Veins.

9 Part of the Right Auricle of the Heart.

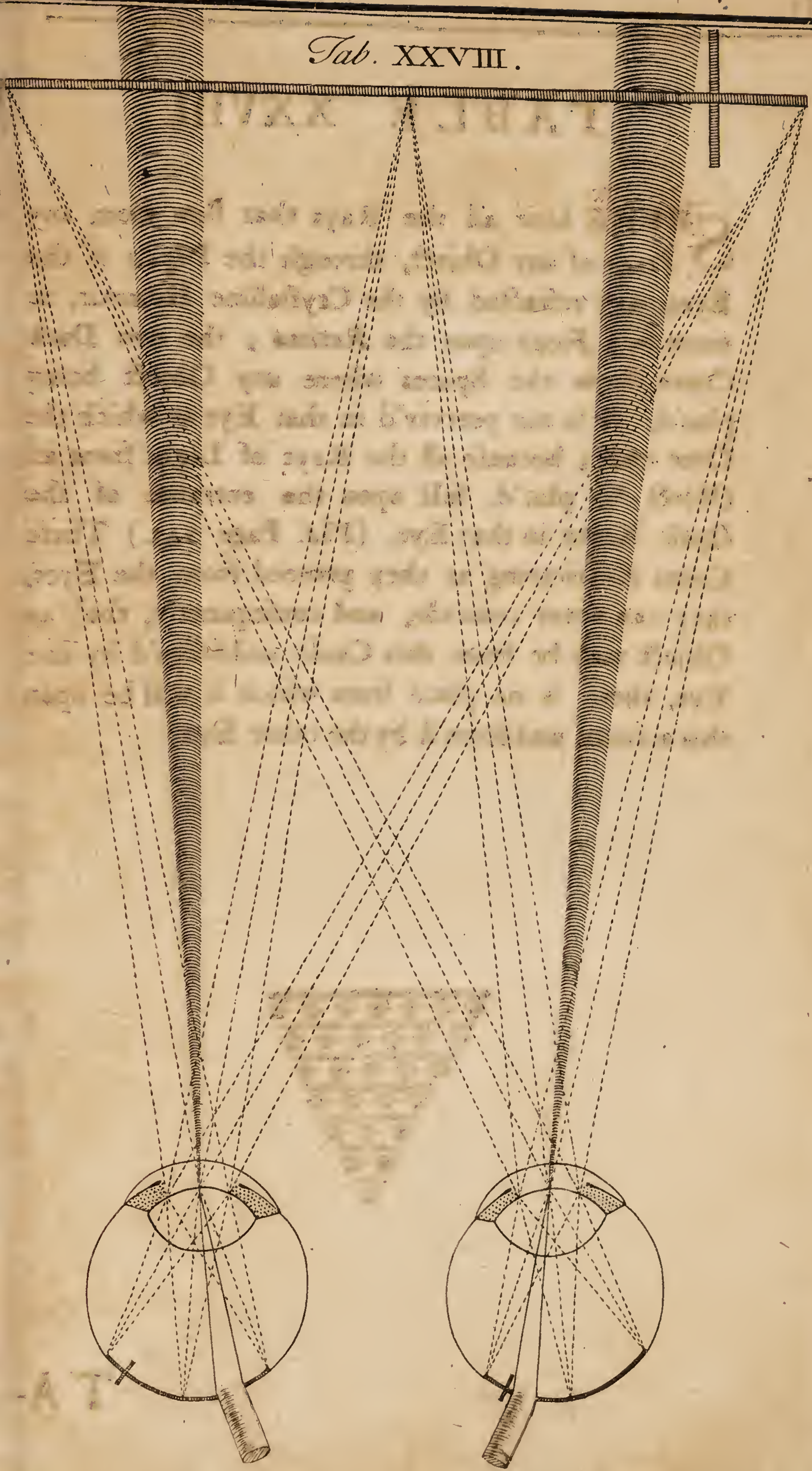
10 Part of the Deſcending *Cava.*

11 *Tuberculum Loweri.*

TABLE XXVIII.

SHEWS how all the Rays that flow from any Point of any Object, through the Pupils of the Eyes, are refracted by the Cryſtalline Humour, to meet in a *Focus* upon the *Retina*; the two Dark Cones ſhew the Spaces where any Object being plac'd, it is not perceiv'd in that Eye in which the Cone ends; becauſe all the Rays of Light from an Object ſo plac'd, fall upon the entrance of the Optic Nerve in that Eye. (*Vid.* Page 243.) Theſe Cones divaricating as they proceed from the Eyes, they can never coincide, and conſequently, tho' an Object may be from this Cauſe undiſcern'd by one Eye, there is no place from which it will be upon this account undiſcern'd by the other Eye.

Tab. XXVIII.



Tab. XXIX.

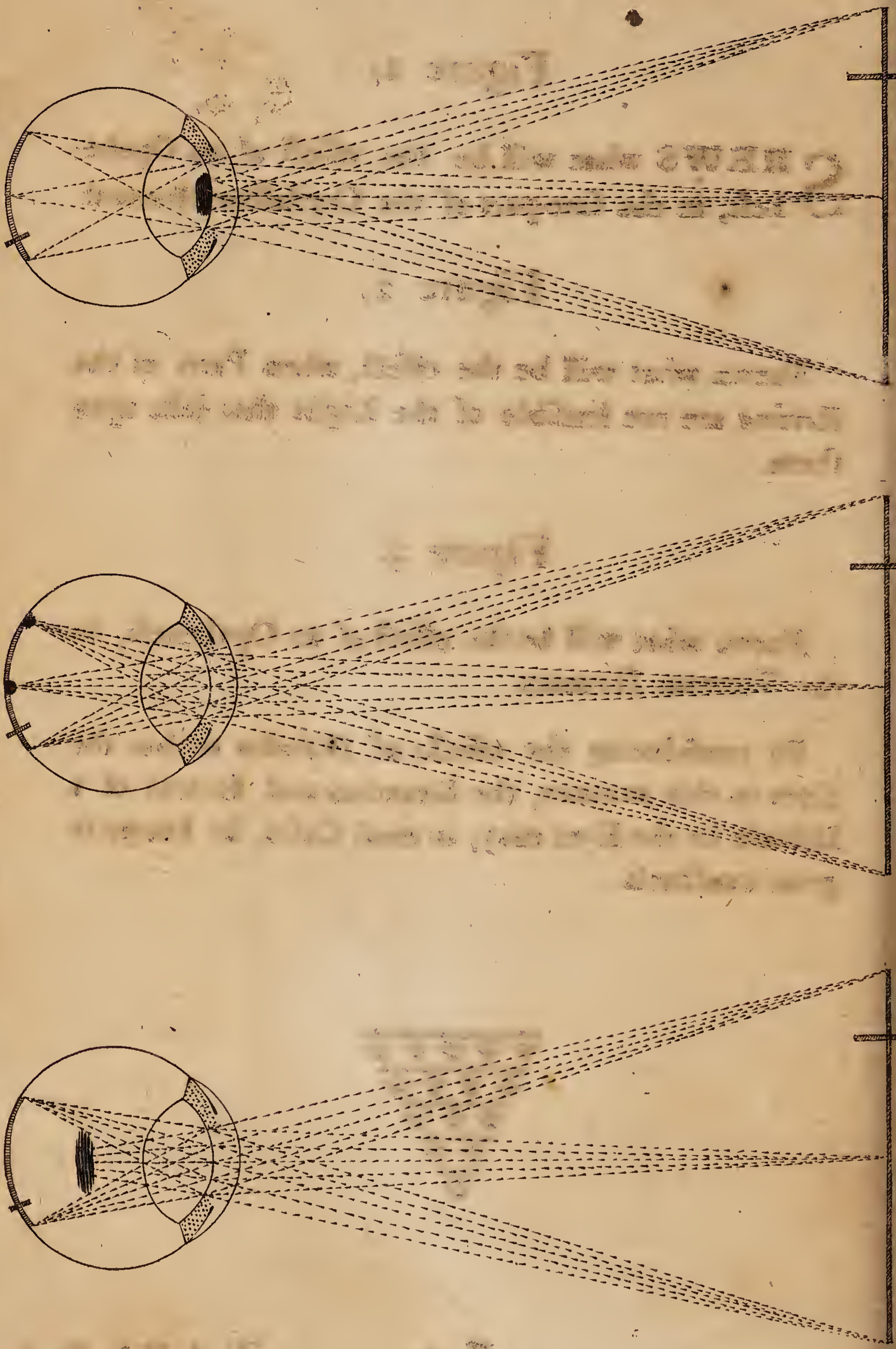


TABLE XXIX.

Figure 1.

SHEWS what will be the effect of an Opakeneſs, in the fore-part of the Cryſtalline Humour.

Figure 2.

Shews what will be the effect, when Parts of the *Retina* are not ſenſible of the Light that falls upon them.

Figure 3.

Shews what will be the effect of an Opakeneſs, in the Vitreous Humour.

By conſidering the effects of Diſeaſes within the Eyes in this manner, the Situation and Extent of a Diſeaſe in the Eyes may, in moſt Caſes, be known to great exactneſs.

TABLE XXX.

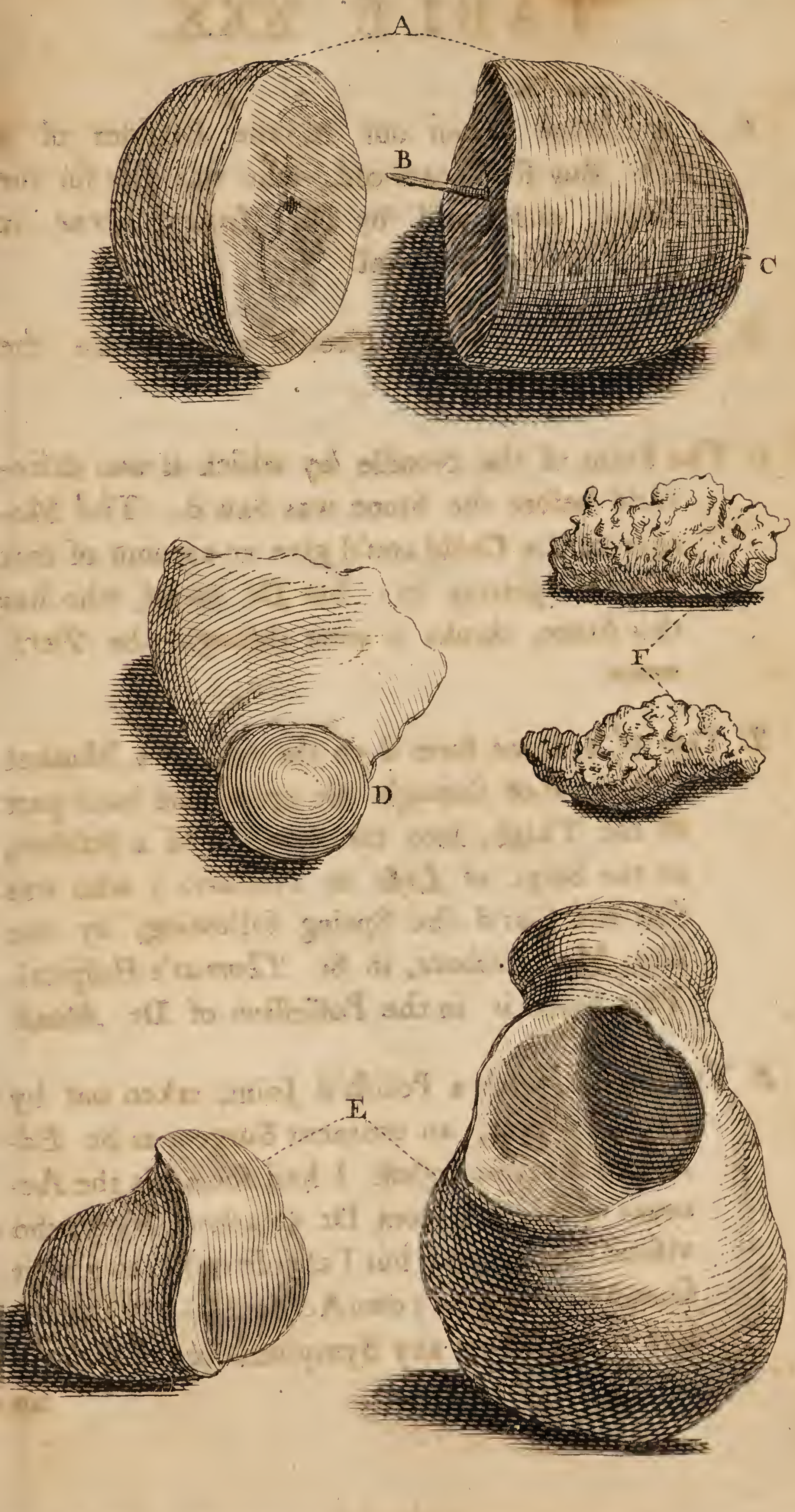
A, A Stone taken out of the Bladder of a Boy five Years old, who was Cut for the Stone, and Cur'd by Mr. *James. Ferne*, in St. *Thomas*'s-Hoſpital.

B The Head of a large Needle upon which the Stone was form'd.

C The Point of the Needle by which it was diſcover'd before the Stone was Saw'd. The Mother of the Child cou'd give no account of this Needle's getting in; but Dr. *Mead*, who has this Stone, thinks it went through the *Perineum*.

D Part of a Stone form'd on the ſide of a Musket Bullet, ſhot through the upper and back-part of the Thigh, into the Bladder of a Soldier, at the Siege of *Liſle* in *Flanders*; who was Cut and Cur'd the Spring following, by the late Mr. *Ridoute*, in St. *Thomas*'s-Hoſpital. This Stone is in the Poſſeſſion of Dr. *Mead*.

E Two Stones, with a Poliſh'd Joint, taken out by Mr. *Sturgeon*, an eminent Surgeon at St. *Edmond*'s-*Bury* in *Suffolk*. I had formerly the Account of this Caſe from Dr. *Craske* of *Bury*, who viſited the Patient; but I chooſe rather to give it from Mr. *Sturgeon*'s own Account.—My Patient had never before any Symptoms of the Stone; he



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he had a total Obſtruction of Urine for Ten Days before I was ſent for: I found a Mortification begun on one Side of the *Perineum*, the ſame Side of the *Scrotum* and *Penis*, with all the Region of the *Os Pubis*. I firſt paſs'd a *Catheter*, and finding the Stone, I immediately Cut thro' the Mortification in *Perineo*, without a Staff, and took out the bigger Stone, and upon obſerving the Joint in the Stone, made a farther Search, and took out the other Stone, and then took care of the Mortification, which in time caſt off. The Urine came through the Wound twenty Days; and now the Patient is in every reſpect well.

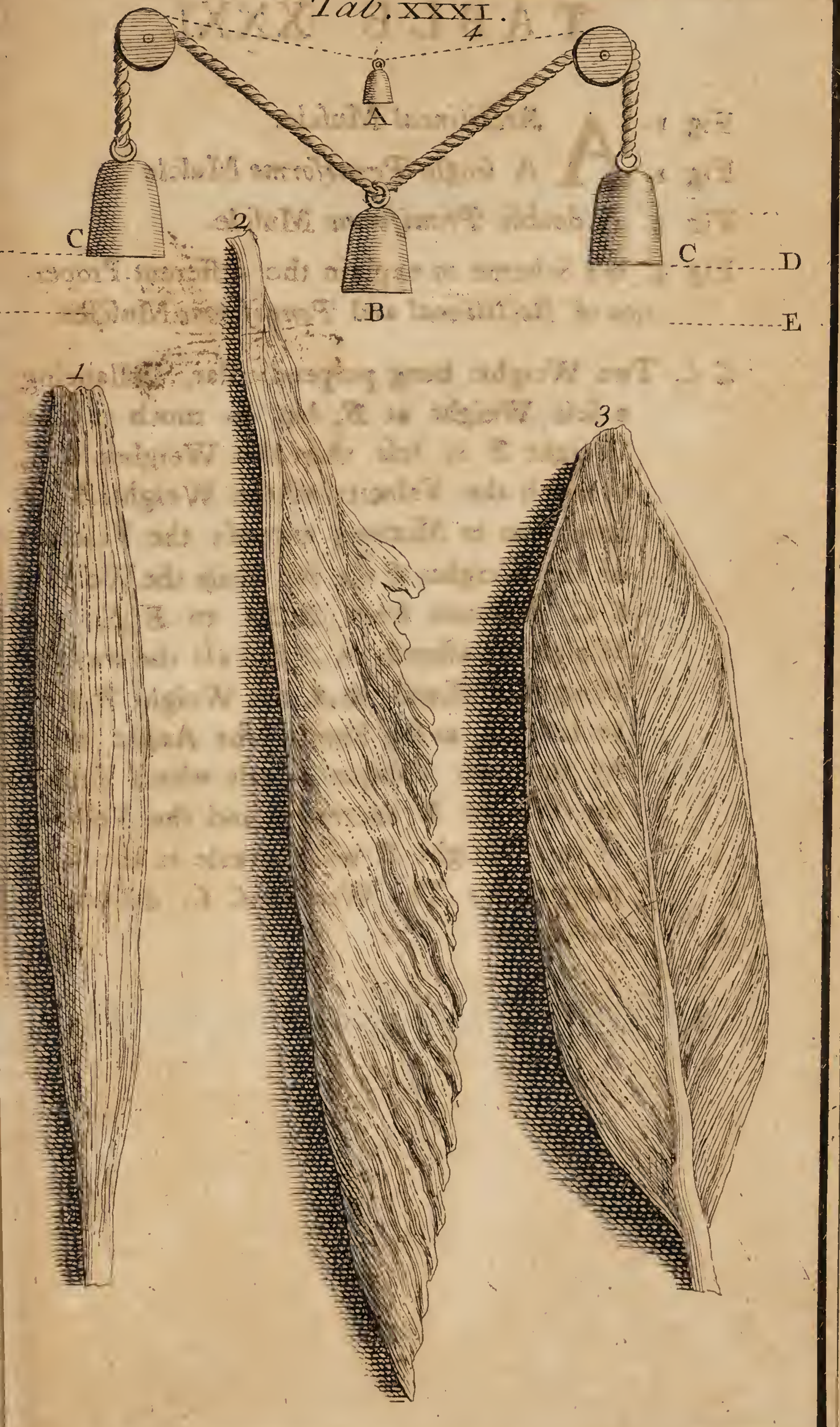
F Two Stones taken from the Valves of the *Aorta*.

TABLE XXXI.

Fig. 1. A *Rectilineal* Muſcle.
Fig. 2. A ſingle *Penniforme* Muſcle.
Fig. 3. A double *Penniforme* Muſcle.
Fig. 4. Is a Scheme to explain the different Properties of *Rectilineal* and *Penniforme* Muſcles.

C C, Two Weights hung perpendicular, ballancing a leſs Weight at *B*, but ſo much as the Weight *B* is leſs than the Weights *C C*, ſo much the Velocity of the Weight *B* (it being put in Motion) exceeds the Velocity of the Weights *C C*; for while the Weights *C C* deſcends from *D D* to *E E*, the Weight *B* aſcends to *A*, but all the way the Weight *B* aſcends to *A*, the Weight *B* muſt be leſſen'd, as the Sine of the Angle made by the two oblique Cords which ſuſtain the Weight *B* encreaſes, and the Velocity of the Weight *B* will encreaſe in the ſame proportion: The Weights *C C*, deſcending uniformly.

Tab. XXXI.



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